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BURSAE AND TENDON SHEATHS OF THE HORSE

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Introduction

The study of the bursae and tendon-sheaths of the horse forms an important link between anatomy and surgery. The chief points of consideration in such a study are : mode of origin ; frequency of occurrence and recognition as such ; topographical relationships ; nomenclature ; function, and association with pathological conditions. An article by Dr. Friedrich Müller† of the School of Veterinary Anatomy, Leipzig University, illustrates the majority of the above points. The object of the present paper is to present :—

I. An edited translation of Müller's article ;

II. An illustrated list of the bursae and tendon-sheaths of the horse, with accompanying legends based on those furnished by Müller ;

III. A critical review of some of the main implications of the work, together with certain original observations.

I. Article by Dr. F. Muller : Edited Translation and Original References

Müller emphasises the importance, both to the surgeon and to the practitioner, of an exact knowledge of the topography of bursae and tendon-sheaths, and states that it is the task of anatomists to furnish authoritative descriptions of these structures. In 1883, Eichbaum published a description of them, but unfortunately he did not include illustrations to indicate their exact position. The descriptions given by later authors are contradictory, due chiefly to the copying of mistakes from other sources. Müller has attempted to rectify these mistakes, and in many cases has checked the exact position of the structures by dissection. Diagrams which are reproduced in text books also give a false impression of their true appearance, on account of the fact that they have been drawn from injected specimens and so appear unnaturally distended as though diseased. In health, the actual structure, in the case of bursae especially, is so fine that it is only with great dexterity and care that one can succeed in making a preparation which is neither distorted nor torn.

The function of bursae and tendon-sheaths is to facilitate the passage of skin, muscle, tendon or ligament over a hard underlying structure, and according to their position they are distinguished as *subcutaneous*, *subfascial*, *subligamentous*, *submuscular* and *subtendinous bursae*, and as *tendon-sheaths*. In discussing this classification, Müller states that, according to Eichbaum and later authors, the subcutaneous bursae are those which lie under the superficial fascia, while subfascial bursae are those lying beneath the deep fascia. (The term " subcutaneous " is one which is commonly but often erroneously employed in anatomy.) This phraseology is bound to lead to a contradiction in terms. Müller does not attempt to introduce a new nomenclature or to change popular terms, as this would lead only to a further confusion of the issue. At the same time, he is strongly of the opinion that the question of nomenclature should receive attention. He provides a description of the superficial fascia, which shows a very uneven distribution in the different parts of the body, and which is often associated with the cutaneous muscle—the co-called *panniculus carnosus*. In parts it is in the form of a dense sheet, which can be raised from the underlying tissues, whereas in others it is not possible to separate it as an independent structure. There is sometimes an additional layer between the " superficial fascia " and the skin, due to the development of connective tissue following mechanical stress. Bursae present beneath this additional layer are marked with an asterisk in the legends accompanying the diagrams. It is the confusion of these relationships which has given rise to the commonly accepted names of subcutaneous and subfascial bursae.

The presence of bursae is not constant, but depends, among other factors, upon the age, constitution and type of work of the animal. This is true particularly of the subcutaneous bursae, the remaining types being more or less regularly encountered and on this account termed " typical." Most typical bursae are present or preformed at birth, although a few appear later : those which develop later are formed in accordance with the requirements of a muscle or group of muscles, and appear to be developed in the same way as the subcutaneous bursae. According to Eichbaum, *subcutaneous bursae* grow as a result of mechanical effects in post-natal life, and might therefore be termed " reactive " or " functional."

The mode of formation of subcutaneous bursae is as follows. Movement of the skin causes a tearing of the subcutaneous connective tissue and leads to the formation of a gap which becomes filled with fluid. The walls of the cavity thus formed gradually become smooth as the result of friction, so that only a few fibrous tissue elements remain within the bursa when it is finally formed. The size and distribution of this class of bursa are naturally very variable ; bursae on one side of the body often show marked developmental differences from those on the other side, and in some cases a corresponding bursa is wanting entirely. They are found in situations in which the skin passes over a protruding portion of bone, *e.g.* olecranon process of the ulna, tuber coxae, os calcis and patella.

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† Schleimbeutel und Sehnenscheiden des Pferdes. *Arch. wiss. prakt Tierheilk.* (1936.) **70.** pp. 351-370.

The *subfascial bursae* are few in number, being situated chiefly in the hind limb. Important sites are the hip and stifle joints, the tendinous aspect of the tarsus, and around the attachments of the eye. They are usually very spacious—up to the size of a hen's egg.*

The *subligamentous bursae* are also few in number, and their size varies from that of a bean to that of an apple. They are found in the region of the stifle and tarsal joints, and under the *ligamentum nuchae*. In the last-named positions they are of especial surgical importance (fistulous withers and poll-evil).

The *submuscular* and *subtendinous bursae* are associated with the origins and insertions of muscles and tendons respectively, and also with the passage of these structures over bony prominences. They are found chiefly in the limbs, but occur also in the head, neck and dorsal regions. Their appearance and form vary greatly, and the subtendinous type is the more common.

The *tendon sheaths* enclose, in a longitudinal direction, the large tendons on the extensor and flexor aspects of the joints of the limbs. There are also two in the head, about the tendons of the *M. levator labii superioris proprius*. The individual sheaths vary greatly in length, but their presence is constant and they are all developed during ante-natal life.

Tendon sheaths and bursae are similar not only in the physiological sense but also in structure and mode of development. Only in external form can the two be distinguished, although in intermediary stages of development a degree of differentiation may be recognised. A bursa has the original form of a more or less flattened sac, the ends of which are rounded. The inner surfaces are in contact one with the other, but are able to move over one another by virtue of the fluid which is enclosed in the sac. Such a description holds true for all subcutaneous, subfascial and submuscular, and for the majority of subtendinous, bursae.

Different types of bursae may exist in layers in the same part of the body, but associated with different structures: there may therefore be firstly, a subcutaneous, secondly, a subfascial, and then in the depths yet another type of bursa.

Subtendinous bursae are found not only between a tendon and its underlying prominence but also on the lateral aspect of the tendon, *e.g. M. flexor digitalis pedis superficialis* passing over the *os calcis* (B. st 37). Further, they may extend even to the superficial aspect, forming the so-called "bursal sheaths" or *bursae vaginalis*, *e.g.* between the *M. biceps brachii* and the bicipital groove of the humerus, the *B. intertubercularis* in B. st 8. (See Fig. 1b.) In the case of tendon sheaths, this extension is carried a step further, the portions which have grown around the tendon actually joining with one another. In this way the sheaths come to possess continuous parietal and visceral layers, analogous to the mesentery, the two being joined by a connective portion termed the *mesotendon*. (Fig. 1c.) It is at this point that the blood-vessels and nerves enter between the sheath and the tendon. In some cases, the mesotendon may disappear leaving only a strand of tissue—the so-called "*Vincula tendon*." (Fig. 1f.) The mesotendon is never situated on the pressure side of the sheath, but on either the superficial surface or on one of the edges of the tendon. (Fig. 1c.) Two adjacent tendons may be surrounded by the same sheath, and in this case the adjacent portions of the two visceral layers are connected by strands of the mesotendon. (Fig. 1g.) Bursae may join up with one another, so that one large one replaces two smaller ones. In areas in which lack of continuity of tissue enables one structure to come into contact with another, a number of bursae may join up, or bursae may join with tendon sheaths and joint cavities. This fact is of great practical importance, as disease processes may readily pass from one part of such a structure to another. These communications show considerable variation, and in only a few sites may they with safety be regarded as constant. According to both Heinecke and Eichbaum, they may be the result of tissue atrophy in old age. This may account for their variable occurrence.

From the histological viewpoint, tendon sheaths and bursae are identical, and are constructed on the same principle as the joint capsule. The walls are of varying thickness, but often are so fine that it is impossible to dissect them out. They consist of a superficial layer of taut connective tissue, and of a synovial layer, which may be interspersed with islets of cartilage. The synovial layer often possesses villous-like projections which give it a folded appearance. On the inner surface of the synovial layer very small amounts of fluid are found.

Many investigations have been carried out and various hypotheses put forward regarding the structure of the actual synovial membrane. Müller points out that there is as yet no satisfactory explanation of the formation of the synovial fluid. Vaubel (1933) suggests that detritus or mucoid degeneration of the synovial tissue is not responsible for the formation of synovial fluid, but that it is produced by an inner layer of cells, the so-called synoviablasts. Zimmermann (1936), however, supports the theory of degeneration. Ackerknecht (1934) regards the problem as unsolved. Even though there is doubt concerning its mode of origin, synovia has been shown by physiologists to be a true secretion, yellow in colour, and, on account of its mucilaginous properties, becoming viscous on movement.

* The sizes given are for bursae distended with air; this is in accordance with the method employed by Eichbaum.

Original References

Ackerknecht, Eb. (1934.) *Berl. tierärztl. Wschr.* 673.

Albertini, A. von. (1929.) Handbuch der speziellen pathologischen Anatomie und Histologie. Vol. 9. Berlin.

Chaveau, Arloing and Lesbre. (1903.) Traité d'Anatomie comparée. Vol. 1. 5th edition. Paris.

Domény, P. (1897.) *Arch. Anat.* 295-306.

Eichbaum, F. (1883). *Arch. Tierheilk.* **9.** 79-127.

——. (1888.) *Ibid.* **14.** 280-308.

——. (1889.) *Ibid.* **15.** 66-99; 187-216.

Ellenberger—Baum. (1932.) Handbuch der vergleichenden Anatomie der Haustiere. 17th edition. Berlin.

Ellenberger—Scheunert. (1920.) Lehrbuch der vergleichenden Physiologie der Haussäugetiere. 2nd edition. Berlin.

Heinecke. (1867.) Anatomie und Pathologie der Schleimbeutel und Sehnenscheiden.

Ludwig, E. (1935.) Vehr. Schweiz Naturforsch. Ges. 116 and 370.

Martin, P. (1914.) Lehrbuch der Anatomie der Haustiere. Vol. 2, 2nd edition. Stuttgart.

Möller-Frick. (1920.) Allgemeine Chirurgie für Tierärzte, 4th edition. Stuttgart.

Montané and Bourdelles. (1913.) Anatomie régional des animaux domestiques. 1, Horse. Paris.

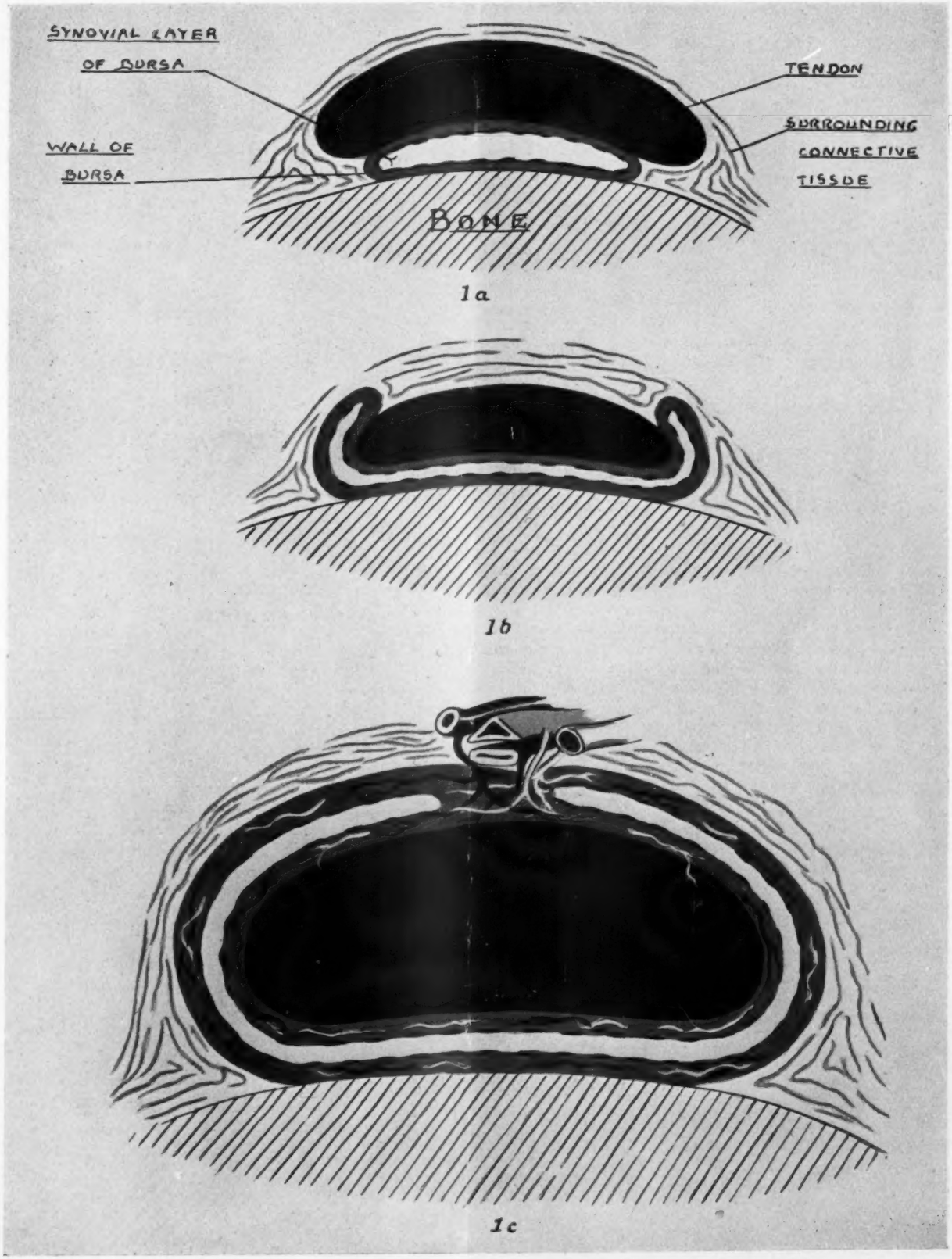
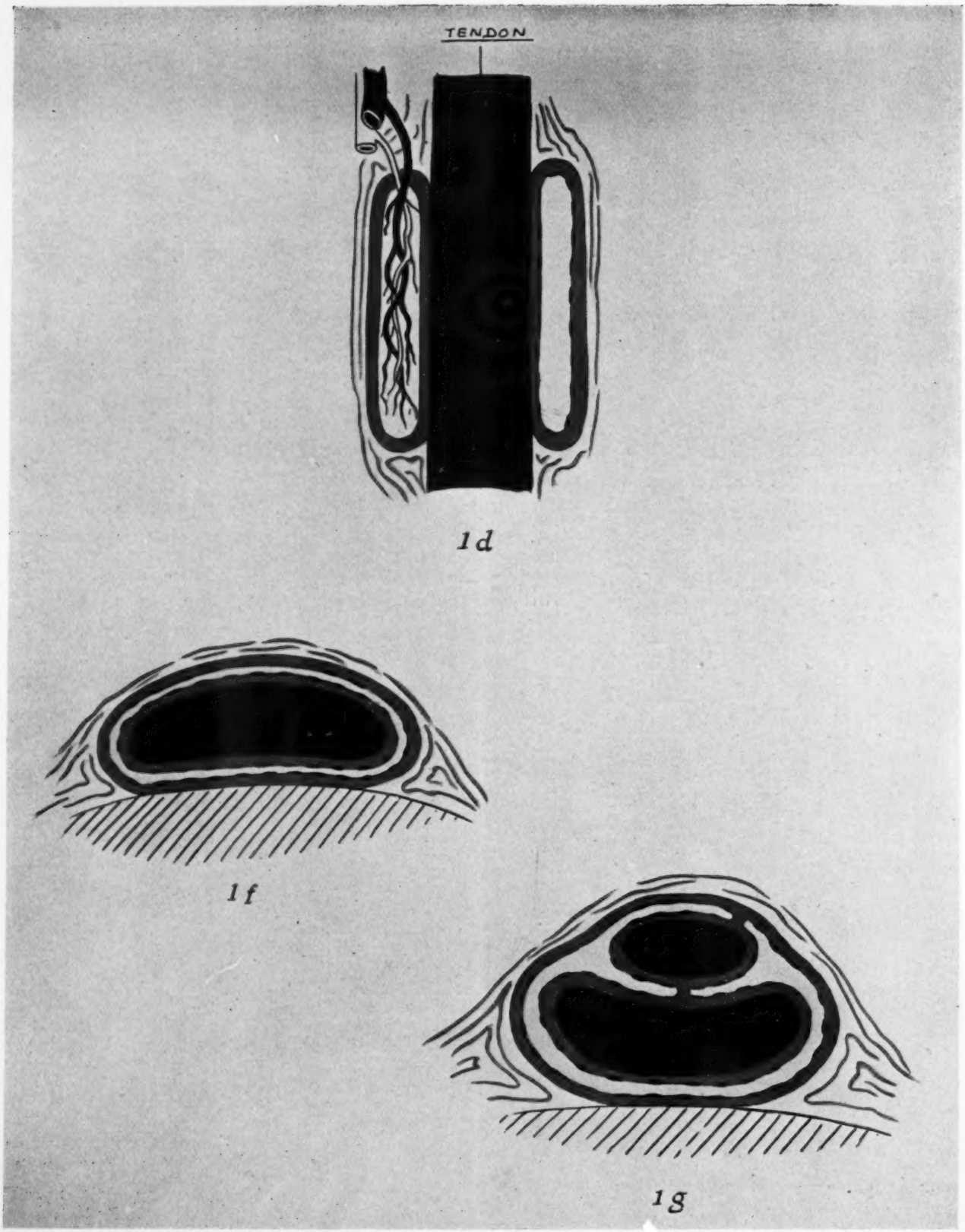


FIG. 1.—SCHEMATIC REPRESENTATION OF BURSAE AND TENDON SHEATHS

(*a*) Simple bursa in cross section.
(*b*) Simple bursa in cross section, showing extension of bursa to superficial aspect of the tendon or muscle—a bursa vaginalis.
(*c*) Tendon sheath and mesotendon in cross section, showing the entry of blood vessels, lymphatics and nerves.



(*d*) Tendon sheath and mesotendon, with blood vessels, in longitudinal section.
(*f*) Tendon sheath in cross section without mesotendon. (No reproduction of the vincula tendon is drawn.)
(*g*) Common tendon sheath for two tendons in cross section, showing mesotendons and area of contact between the sheaths.

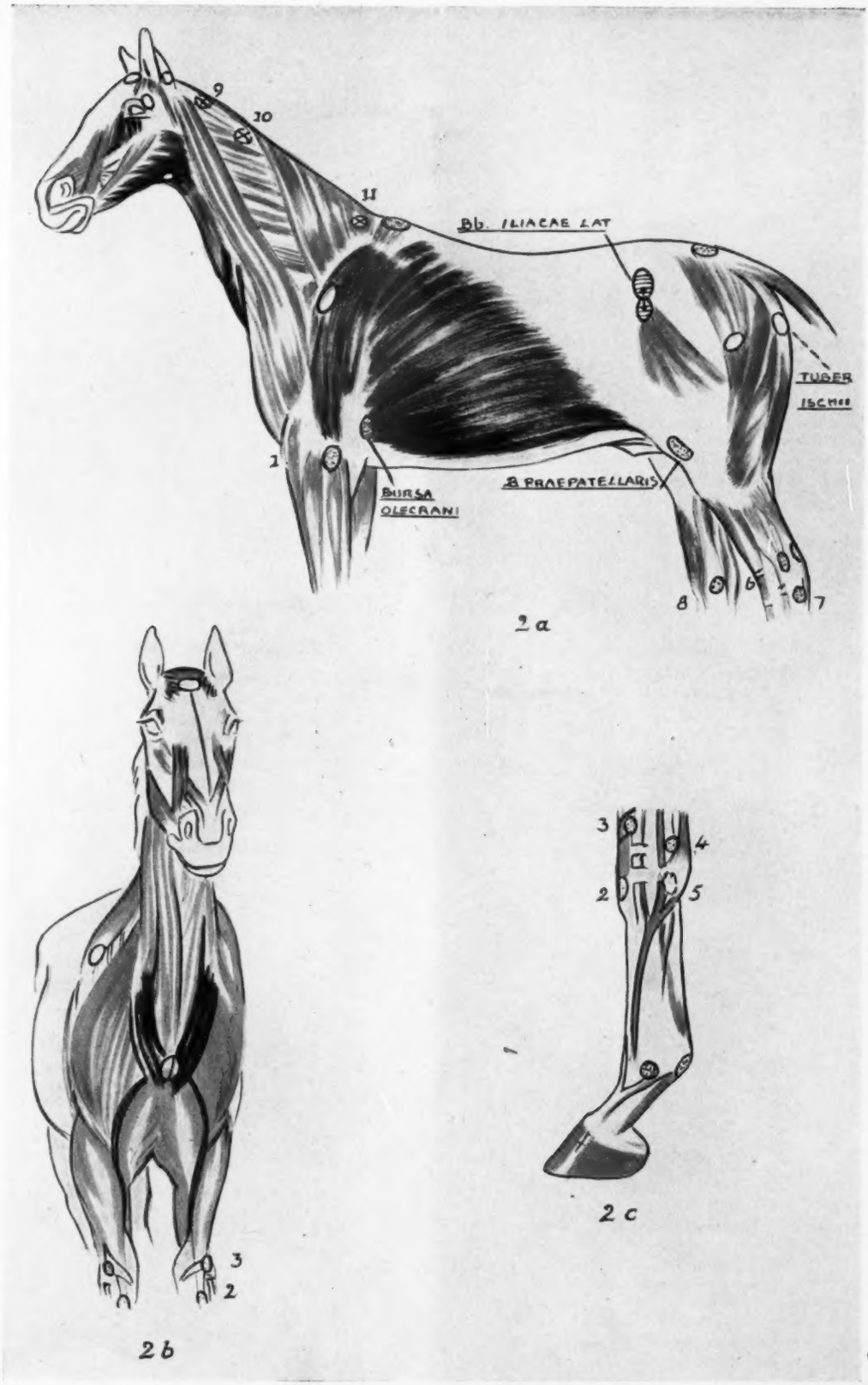


FIG. 2.—THE SUBCUTANEOUS BURSAE

White—rare.
Dotted—common.
Lineated—constant.
(*a*) Lateral view. (9, 10, 11, specially marked subligamentous bursae associated with the ligamentum nuchae—*see* under legend for subligamentous bursae.)
(*b*) Anterior view.
(*c*) Lateral view of the distal portion of the near fore limb.

PAULLI, S., and SÖRENSEN, E. (1930.) Kgl. tierärztl. Landw. Hoch. Copenhagen.
SCHAUDER, W. (1924). *Berl. tierärztl. Wschr.* 593-595.
SCHMALTZ, R. (1928.) Anatomie des Pferdes. 2nd edition. Berlin.
——. (1914.) *Berl. tierärztl. Wschr.* 648.
SCHMIDTEN, P. (1906). Diss. Giessen.
STRUSKA. (1903.) Anatomie der Haustiere. Vienna and Leipzig.
SUSSDORF, M. (1895). Lehrbuch der vergleichenden Anatomie der Haustiere. Vol. I. Stuttgart.
TANDLER. (1919). Lehrbuch der systemischen Anatomie. Vol. I. Leipzig.
TESTUT. (1921). Traité d'Anatomie humaine. Vol. I, 7th edition. Paris.
TRAUTMANN-FIEBIGER. (1931.) Histologie und vergleichendende mikroskopische Anatomie der Haussäugetiere. 6th edition. Berlin.
VAUBEL, E. (1933.) *Virchows Arch.* **289.** 1-18.
ZIETSZCHMANN, O., and KRÜGER, W. Anleitung zum Präparieren, Hannover.
ZIMMERL, H. (1929.) Trattato di Anatomia veterinaria. Vol. I. Milan.
ZIMMERMANN, A. (1936.) *Jber. Vet. med.* **58.**

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II. Legends and Diagrams

INTRODUCTION

In the following illustrations the bones and muscles are represented diagrammatically, and only those muscles which demonstrate the position of the bursae and tendon sheaths are included. The bursae are not drawn strictly to scale. A dotted outline indicates that the structure is deep. Communications with joint cavities are marked; but the capsular ligaments of joints are not represented.

Whereas all bursae and tendon sheaths may exhibit pathological changes, in some the diseased condition is referred to by a common name which we have introduced in square brackets after the description of the structure in question.

Other explanations are noted with the individual diagrams.

Legends

A.—SUBCUTANEOUS BURSAE.

(Figures 2a, b, c.)

(1) On the occipital crest (ext. occipital protuberance) of the occipital bone. Fig. 2a. (Rare.) [Poll Evil.]

(2) On the junction of the parietal crest with the frontal bone. Figs. 2a and b. (Rare.)

(3) On the zygomatic process of the squamous temporal bone, near the outer canthus of the eye. Fig. 2a. (Very rare.)

(4) On the angle of the jaw. Fig. 2a. (Rare.)

(5) On the spines of the 5th, 6th and 7th thoracic vertebrae. Fig. 2a. (Common.) [Fistulous Withers.]

(6) On the spines of the 1st and 2nd sacral vertebrae. Fig. 2a. (Common.)

*(7) On the dorsal and ventral extremities of the tuber coxae (angle of the haunch). The upper one is the larger, they usually communicate. Fig. 2a. (Constant.) These bursae are sometimes referred to as the iliacae lateralis.

(8) On both sides of the cariniform cartilage of the sternum, over the origins of the Mm. sterno maxillaris, the two being separated by a septum. Fig. 2b. (Rare.) These bursae are at the level of the shoulder joint.

(9) On the lateral side of the tuber ischii, above the M. semitendinosus. Fig. 2a. (Rare.) This bursa has been noticed in bad cases of spavin.

*(10) On the tubercle of the spine of the scapula, usually towards the lower part. Figs. 2a and b. (Rare.)

*(11) On the posterior surface of the olecranon process of the ulna—bursa olecrani. Fig. 2a. (Large and very common.) [Capped Elbow.]

(12) On the lateral ligament of the elbow joint at the proximal extremity of the radius, of variable size. Fig. $2a^1$. (Common.)

(13) On the os magnum (3rd carpal) bone. Figs. $2b^3$ and c^2. (Small but common.)

(14) On the anterior or dorsal surface of the distal third of the radius over the medial edge of the M. extensor digitalis communis (extensor pedis). Figs. $2b^3$ and c^3. (Common.)

(15) On the lateral ligament of the carpal joint, at the distal extremity of the radius. Fig. $2c^4$. (Common.)

(16) On the head of the medial small metacarpal bone. Fig. $2c^5$. (Rare.) This bursa is shown deep in this diagram.

(17) On the plantar or volar surface of the fetlock joint. Fig. 2c. (Very small but common.)

(18) On the lateral aspect of the fetlock joint, just above the anterior division of the M. interosseous (suspensory ligament.) Fig. 2c. (Common.)

(19) On the summit of the great trochanter of the femur. Fig. 2a. (Rare.) This bursa has been noticed in bad cases of spavin.

*(20) On the anterior aspect of the patella, inferior to the insertion of the quadriceps extensor cruris group of muscles. The prepatella bursa. Fig. 2a. (Present in about 50 per cent. of cases.)

*(21) Above the tuber calcis, on the plantar aspect of the tendon of the M. flexor digitalis pedis superficialis (flexor perforatus); this bursa is usually oval in shape. Fig. 2a. (Very common.) [Capped Hock.]

*(22) On the lateral (ext.) malleolus of the tibia. This bursa is subfascial in some cases. Fig. $2a^6$. (Common.)

(23) On the cuboid or fourth tarsal bone. Fig. $2a^7$. (Small but common.)

*(24) On the medial (int.) malleolus of the tibia, in some cases multiple adjacent bursae may be found. Fig. $2a^8$. (Common.)

B.—SUBFASCIAL BURSAE

(Figures 4a and f)

†(1) Associated with Tenon's capsule, under the fascia of the eye, between the fascia and the eyeball.

(2) Under the gluteal fascia, at the level of the posterior edge of the great trochanter of the femur. Between the tendon of the M. superficial gluteus and the sacral head of the M. biceps femoris. Fig. 4a. (Very common.)

(3) Under the fascia lata, where this fascia meets the aponeurosis of the M. biceps femoris over the edge of the patella. This bursa is medial to that under the M. vastus lateralis (externus). Fig. 4a. (Constant.)

(4) Under the crural fascia, on the distal third of the anterior surface of the shaft of the tibia. Beginning on the medial edge of the tibia, this bursa passes over the tendon of the M. peroneus tertius, to the tendon of which it is joined, and ends shortly before the division of this muscle into its tendons of insertion; it averages 8 to 10 cm. in length. Fig. 4f. (Constant.)

(5) Under the crural fascia, on the distal third of the lateral aspect of the shaft of the tibia. It extends from the lateral edge of the tibia to join with the fascia covering the M. extensor digitalis longus (extensor pedis). It attains a length of from 4 to 5 cm. Fig. 4f. (Constant.)

†(6) Under the fascia, on the anterior surface of the hock joint, between the large metatarsal and the cuneiform magnum (3rd tarsal) and cuneiform parvum (1st and 2nd tarsal) bones. [A few small inconstant bursae situated around the seat of spavin.]

* Subcutaneous bursae found beneath the additional superficial fascia.

† Bursae not shown in any of the diagrams.

C.—SUBLIGAMENTOUS BURSAE

(Figures 2a and 4a, b, c, e)

(1) Under the attachment of the ligamentum nuchae, between its funicular portions and the M. rectus capitis posticus or dorsalis major. A very large bursa—the atlantal bursa. Fig. 2a[9]. (Common.) [Poll Evil.]

(2) Under the ligamentum nuchae in the region of the axis; between the posterior divisions of the spine of the axis and an attachment of the M. complexus on both sides of the body. Fig. 2a[10].

(3) Under the ligamentum nuchae or supraspinous ligament on the spinous processes of the 3rd and 4th thoracic vertebrae. 2a[11]. (Very common.) [Fistulous Withers.]

†(4) Under the odontoid ligament on the odontoid process of the axis. (Small but constant.)

(5) Under the proximal portion of the lateral ligament of the stifle joint on the tendon of origin of the M. popliteus. Figs. 4a and c. (Constant.)

(6) Under the distal portion of the lateral ligament of the stifle joint on the head of the fibula. Figs. 4a and c. (Constant.)

(7) Under the distal portion of the medial ligament of the stifle joint. This bursae begins at the level of the semilunar cartilage, covering this and the proximal extremity of the tibia. It is 3 to 4 cm. in length. Through an opening of 1½ to 2 cm. it communicates with the stifle joint. Figs. 4b and c.

(8) Between the two cruciate ligaments of the stifle joint, with the cavities of which it communicates. Fig. 4e. (Constant.)

(9) Between the divisions of the medial ligament of the hock joint. A small bursa. Fig. 4b.

The three subligamentous bursae shown in Fig. 2a and numbered 9, 10, 11, are marked with a cross in that figure to distinguish them from the subcutaneous bursae.

D.—SUBMUSCULAR BURSAE

(Figures 3a and b, 4a, b, and d)

†(1) Between the M. obliquus oculi superioris and its pulley. (Small but constant.)

†(2) Just anterior to the glossal process of the hyoid bone, between the M. genio-hyoideus and the M. genio-glossus and their fasciae. (Very rare.) [Branchial cysts ?]

†(3) Under the divisions of the M. complexus, on the articular process of the 3rd to 6th cervical vertebrae. (Common.)

†(4) In the region of the 6th cervical vertebra, between the M. ilio-costalis (transversalis costarum) and the tendon of the longus colli. (Very rare.)

(5) Under the M. teres minor, between this muscle and the posterior aspect of the capsular ligament of the shoulder joint. This bursa may communicate with the cavity of the shoulder joint. Fig. 3a. (Very common.)

(6) Under the origins of the M. flexor digitalis profundus (deep digital flexor) and the humeral head of the M. flexor carpi ulnaris (flexor metacarpi medius). This bursa extends approximately 3 cm. below the elbow joint. It communicates with the cavity of the joint. Fig. 3b. (Constant.)

(7) Under the M. flexor carpi radialis (flexor metacarpi internus) on the capsule of the elbow joint. Usually joined up with the previous bursa. Fig. 3b. (Common.)

(8) Embedded in the fat under the posterior edge of the M. gluteus profundus, on the medial surface of the great trochanter of the femur. Fig. 4d.

(9) Under the sacral head of the M. semitendinosus, on the tuber ischii. Figs. 4a and b. (Constant.)

† Bursae not shown in any of the diagrams.

E.—SUBTENDINOUS BURSAE

(Figures 3a, b c, and d, 4a, b, c, d, and e.)

†(1) Between the tendons of the M. stylohyoideus and the M. digastricus. Where the intermediate tendon of the digastricus perforates the tendon of the stylohyoideus. Often considered to be a synovial sheath. (Constant.) [Branchial Cysts ?]

†(2) Under the tendon of the M. tensor palati, where it winds round the hamular process of the pterygoid bone. (Constant.)

†(3) On the external occipital protuberance, under the aponeurosis of the M. cervico-scutalaris (auricularis). This bursa is present only in those animals in which the protuberance is prominent.

†(4) Under the tendon of the M. longus colli, on the ventral aspect of the body of the 1st thoracic vertebra. (Constant.)

†(5) Under the tendon of insertion of the M. longissimus dorsi, on the transverse process of the 7th cervical vertebra. (Common.)

(6) Under the infraspinatus tendon on the lateral tuberosity of the humerus: the walls of this bursa are fused to the tendon and also to the underlying lateral or external tuberosity of the humerus. Fig. 3a. (Constant.)

(7) Under the tendon of origin of the M. biceps brachii on the coracoid process of the scapula, separate from the bursa intertubercularis. Figs. 3a and c.

‡(8) Under the extended tendon of the M. biceps brachii on the central ridge of the bicipital groove of the humerus—the bursa intertubercularis. This bursa is joined to the tendon and extends on to the sides and superficial aspect of it. Figs. 3a and c. (Constant.)

(9) Under the origin of the M. coraco brachialis. This bursa extends from the coracoid process to the edge of the M. subscapularis. A few authors refer to this as a synovial sheath, but Müller has found only a bursa. Fig. 3b.

(10) Under the tendon of insertion of the caput longum tricipitis (long head of triceps), on the lateral surface of the olecranon process of the ulna. Fig. 3a. (Constant.) [Deep Capped Elbow.]

(11) Under the tendon of origin of the extensor carpi ulnaris (flexor metacarpi externus) on the lateral tuberosity of the radius, immediately behind the lateral ligament of the elbow joint. Often in direct communication with the cavity of the elbow joint. Fig. 3a. (Constant.)

(12) Under the tendon of insertion of the M. biceps brachii on the radius. Figs. 3a, b and c. (Rare.)

(13) Between the insertions of the M. brachialis (brachialis anticus) and the M. pronator teres (medial ligament of the elbow joint) on the upper extremity of the radius. In the horse the pronator teres muscle is represented by the medial ligament of the elbow joint. Fig. 3b. (Constant.)

(14) Under the tendinous portion of the tensor fasciae antibrachiae (M. scapulo-ulnaris) on the medial surface of the olecranon process of the ulna. Fig. 3b. [Deep Capped Elbow.]

(15) Under the tendon of insertion of the caput mediale triceps (small head of triceps), extending from the edge of the olecranon process almost to the insertion of the tendon. Fig. 3b. (Constant.)

(16) Under the tendon sheath of the extensor carpi radialis (extensor metacarpi magnus) on the os magnum (3rd carpal) bone. Figs. 3a and c. (Small but constant.)

†(17) Under the combined flexor tendons on the distal extremities of the metacarpus and metatarsus. This bursa is situated on the capsular ligament of the fetlock joint, and may communicate with its cavity. (Constant.) [Non-Articular Windgall.]

(18) Under the tendon of the M. extensor digitalis lateralis (extensor suffraginis) on the antero-lateral aspect of the fetlock joint. Figs. 3a and c. (Constant.)

† Bursae not shown in any of the diagrams.

‡ According to Eichbaum *et al.*, other small bursae may be present in the region of the shoulder joint.

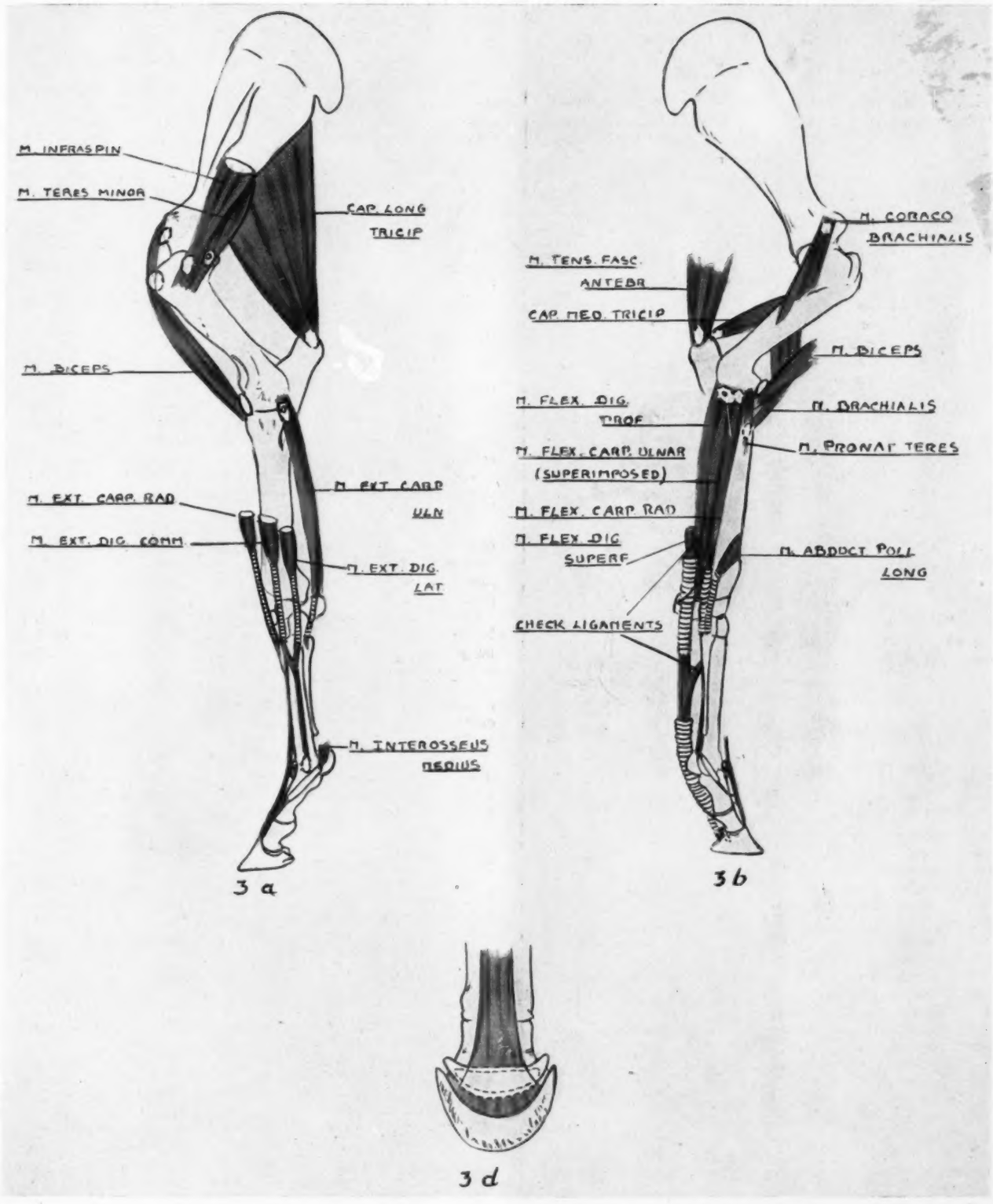


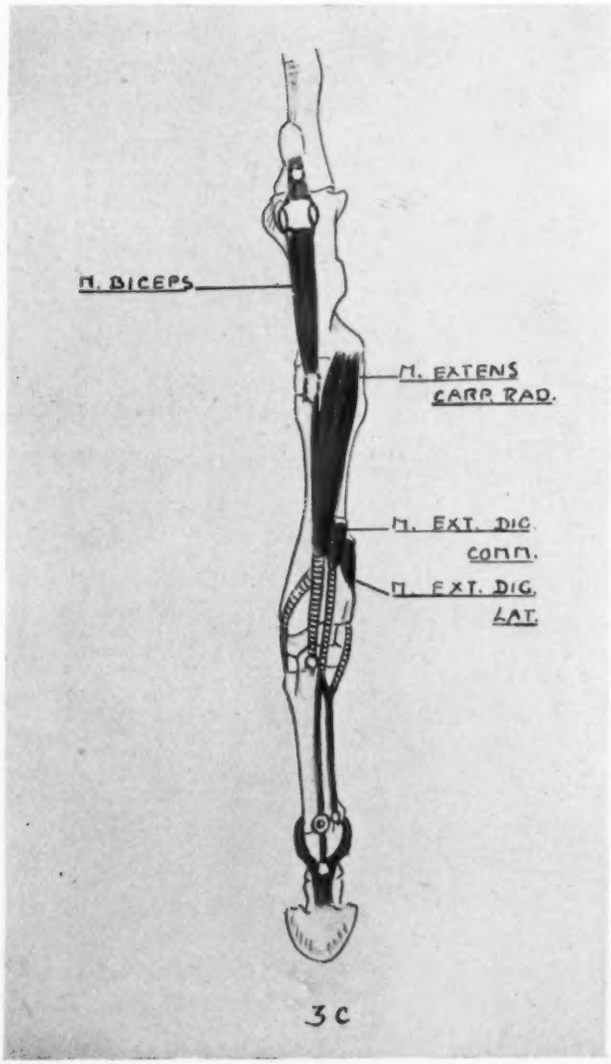
FIG. 3.—THE BURSAE AND TENDON SHEATHS OF THE FORE LIMB

Those marked with a black or half-black circle indicate a constant communication with the cavity of a joint. Those marked with a black or half-black circle with a white centre—inconstant communication. This also applies to figure 4.

(*a*) Lateral or external view.

(*b*) Medial or internal view. In this view the M. flexor carpi ulnaris is drawn more anterior than is its true position so as not to obscure the deep flexors. It is inserted on to the upper edge of the os accessorium (pisiform) as indicated by the arrow.

(*d*) Volar or posterior view of the digit showing the bursa podotrochlearis—present in both fore and hind limbs.



(*c*) Dorsal or anterior view.

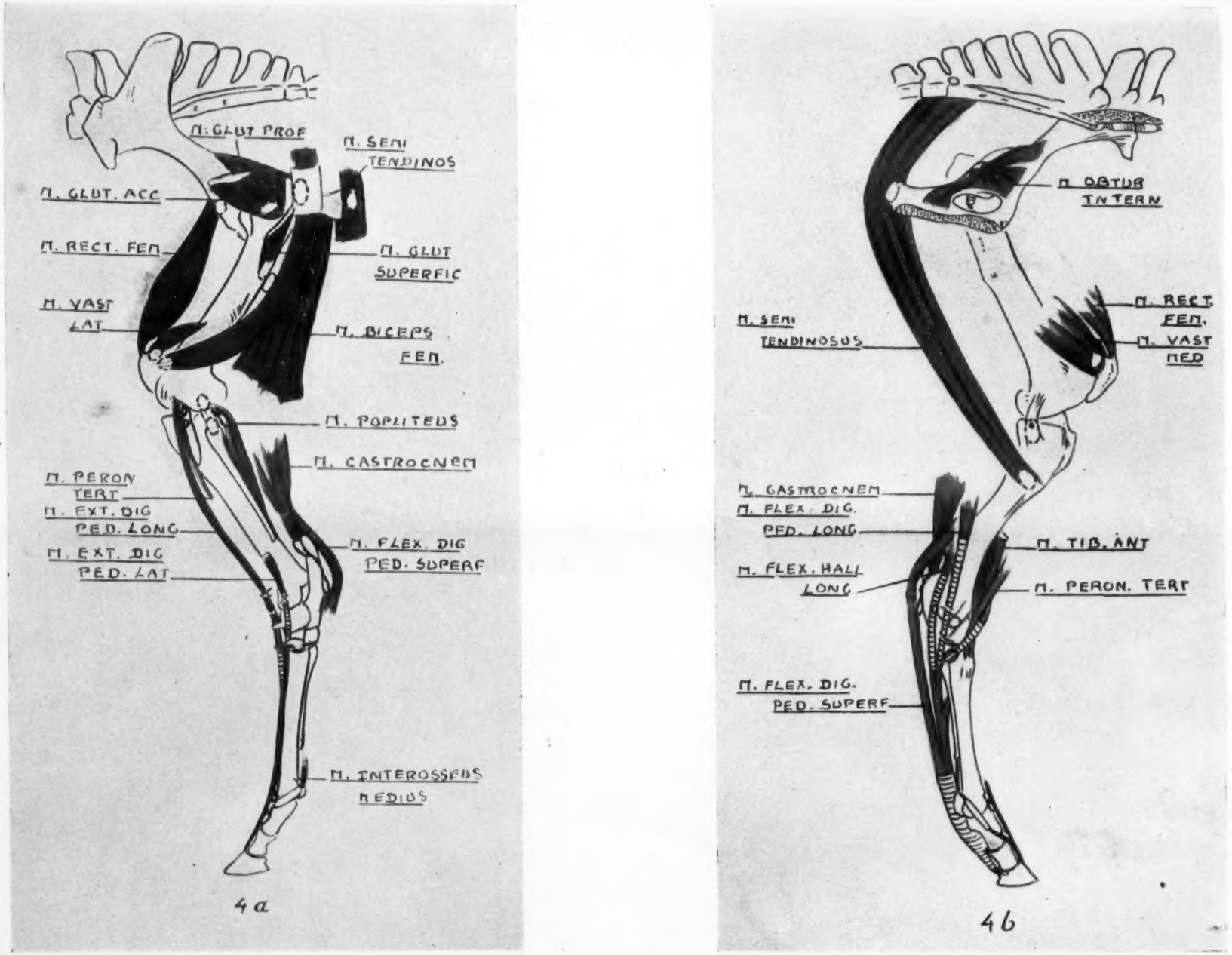
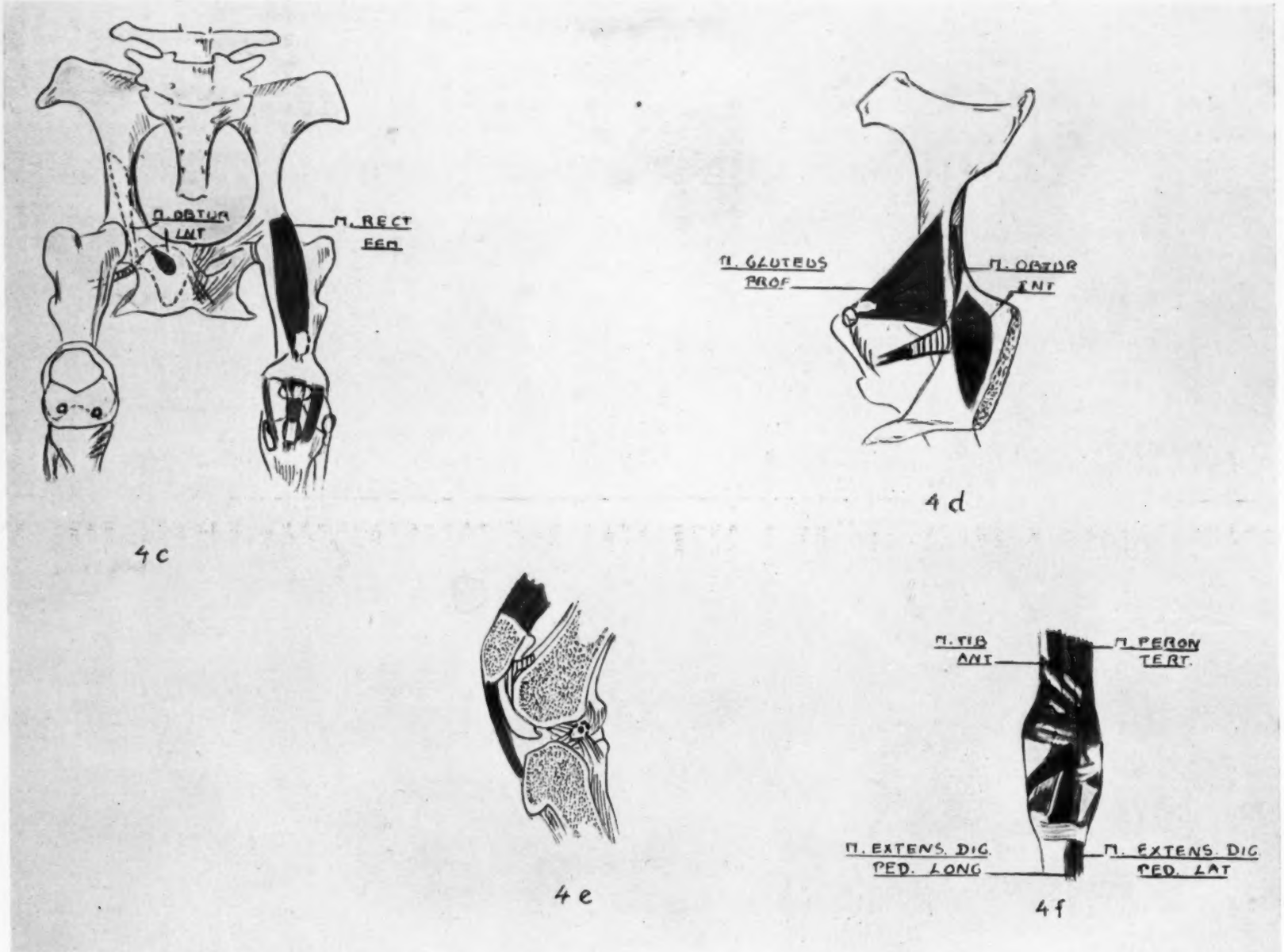


FIG 4.—THE BURSAE AND TENDON SHEATHS OF THE HIND LIMB
See Fig. 3 for explanation of the markings.

(*a*) Lateral or external view. The rectangular area over the M. biceps femoris at the level of the pelvic bone represents a portion of the deep gluteal fascia.
(*b*) Medial or internal view.



(*c*) Anterior view of the pelvic and stifle regions showing the patella bursa.
(*d*) Dorsal view of the hip joint region (deep layer of muscles).
(*e*) Sagittal section of the stifle joint showing the patella bursa and bursa between the cruciate ligaments.
(*f*) Dorsal or flexor aspect of the near hock joint showing subfascial bursae.

(19) Under the anterior divisions of the M. interosseous medius (suspensory ligament) on both sides of the os suffraginis (1st phalanx). This bursa extends from the lateral surface of the sesamoid bone to the upper third or middle of the os suffraginis and might be considered to be a synovial sheath. Figs. 3a, b and c ; 4a and b. (Constant.)

(20) Under the tendon of the M. extensor digitalis communis (extensor pedis), near the union of this tendon with the suspensory ligament. Fig. 3b and c. (Common.)

(21) Under the tendon of the M. flexor digitalis profundus (flexor perforans) on the navicular bone—the bursa podotrochlearis. This bursa completely covers the tendinous surface of the navicular bone, and extends upwards almost to the sesamoidean sheath of the flexor tendons. Figs. 3b and d. (Constant.)

(22) Under the insertion of the M. gluteus superficialis, on the third trochanter of the femur. Fig. 4a. (Rare.)

(23) Under the insertion of the M. gluteus accessorius (middle gluteus) on the convexity of the great trochanter of the femur covering the entire lateral aspect of it—the gluteal bursa, a large bursa. Fig. 4a. (Common.)

(24) Under the tendon of insertion of the M. gluteus profundus, on the medial surface of the great trochanter. Fig. 4d. (Common.)

(25) Under the lateral origin of the M. rectus femoris, on the lateral surface of the ilium near the acetabulum. Fig. 4a. (Constant.)

(26) Under the tendon of the M. biceps femoris on the posterior surface of the shaft of the femur at the level of the third trochanter. Fig. 4a. (Common.)

(27) Under the insertion of the M. rectus femoris on the patella. Fig. 4a, b and c. (Common.)

(28) Under the insertion of the M. vastus lateralis (externus) on the cartilage of the patella ; a little superior to the lateral femoro-patellar ligament. Fig. 4a. (Common.)

(29) Under the insertion of the vastus medialis (internus) on the medial edge of the patella. Fig. 4b. (Common.)

§(30) Under the patellar attachment of the middle straight patellar ligament on the patella. This bursa covers a portion of the anterior surface of the patella and is approximately 2 cm. in diameter. [" Bursa infrapatellaris proximalis " of Schauder (1924).] Fig. 4c. (Constant.)

§(31) Under the tibial attachment of the middle straight patellar ligament on the anterior tuberosity of the tibia. This bursa is joined to the ligament. [" Bursa infrapatellaris distalis " of Schauder (1924).] Fig. 4c. (Constant.)

(32) Under the tendons of insertion of the quadriceps extensor cruris group of muscles and the cartilage of the patella, on the femur in the region of the articular trochlea —the bursa patellaris. It may communicate with the femoro-tibial joint by a small opening, through one or both capsules of the joint. In about 75 per cent. of cases, this opening is on the medial aspect of the joint ; in the remaining 25 per cent., it is on the lateral aspect. The patella is a sesamoid bone associated with the quadriceps extensor cruris and assists in extension of the hind limb. It is subjected, therefore, to a large degree of movement and the position of this bursa is not constant. Movement of the patella is in part facilitated by the presence of this bursa. Fig. 4c and e. (Constant.)

(33) Under the common origin of the M. extensor digitalis pedis longus (extensor pedis) and the M. peroneus tertius. A small but elongated bursa of approximately 15 cm. in length. It extends between these tendons and the lateral surface of the shaft of the tibia. Except in rare cases it communicates with the lateral sac of the femoro-tibial joint. Fig. 4a. (Constant.)

(34) Under the origin of the M. popliteus on the lateral condyle of the femur. It extends from the origin of the muscle to the lateral tuberosity of the tibia, and may communicate with the lateral sac of the femoro-tibial joint. Fig. 4a. (Common.)

(35) Under one tendon of insertion of the tibialicus anticus, *i.e.* the cunean tendon, on the scaphoid (central tarsal) and cuneiform parvum (1st and 2nd tarsal) bones. It is joined with all these structures. Fig. 4b. (Constant.)

(36) Under the insertion of the M. semitendinosus on the tibial crest. Fig. 4b. (Constant.)

(37) Under the tendon of the M. flexor digitalis pedis superficialis (flexor perforatus) on the M. gastrocnemius and the os calcis (fibular tarsal). It lies under the spread out " cap " of the perforatus beginning at the level where this tendon becomes superficial to the gastrocnemius and ending on the middle of the os calcis. It extends on to the sides and superficial surface of the tendon and communicates with the following bursa No. 38. Fig. 4a and b. (Constant.) [Deep Capped Hock.]

(38) Under the insertion of the M. gastrocnemius on the summit of the os calcis. According to Schmaltz (1928), this is not a separate bursa but merely a diverticulum of the preceding. Zietzchmann and Kruger (1929) consider that these bursae—*i.e.* Nos. 37 and 38—constitute the tendon sheath of the tendo Achilles; as the structure is visible on both sides of the tendon, Müller considers No. 38 to be a distinct bursa. Martin describes No. 37 as a sheath, and No. 38 as a bursa. See also Schmaltz (1914). Fig. 4a and b. (Constant.) [Deep Capped Hock.]

The subtendinous bursae in the region of the hind foot are similar to those in the fore limb, with the exception that on the anterior surface of the fetlock joint there is only one bursa. This is due to the fact that the M. extensor digitalis pedis lateralis (peroneus longus) has already joined the M. extensor digitalis pedis longus (extensor pedis) in the upper third of the metatarsus. Figs. 3d and 4a and b.

TENDON SHEATHS

(Figures 3a, b and c ; 4a, b, c and d)

Tendon sheaths surround the following structures.

†(1) Mm. levator labii superioris proprius. Surrounds the tendons in the region of their common insertion to the upper lip.

(2) Extensor carpi radialis (extensor metacarpi magnus). Extends from the junction of the middle and distal thirds of the radius to the region of the bursa under the insertion of the muscle. Figs. 3a and c.

(3) Extensor digitalis communis (extensor pedis). Extends from approximately halfway down the lower third of the radius, to the proximal end of the metacarpus. This sheath actually extends as far as the tendon of origin of Philip's muscle—the muscular slip which comes off the extensor pedis and joins the extensor suffraginis. Sometimes the initial portion of Philip's muscle is surrounded by this sheath. Figs. 3a and c.

(4) Abductor pollicis longus (extensor metacarpi obliquus). Extends from the medial edge of the extensor carpi radialis (extensor metacarpi magnus) to the head of the medial small metacarpal bone. According to Eichbaum this sheath is often represented by a vaginal bursa. Figs. 3b and c.

(5) Extensor digitalis lateralis (extensor suffraginis). Extends from approximately the same level as No. 3 and ends at the proximal extremity of the large metacarpal bone. Figs. 3a and c.

(6) Extensor carpi ulnaris (flexor metacarpi externus). Surrounds the lateral tendon of insertion of this muscle from the level of the pisiform (os accessorium) to that of the unciform (4th carpal). It is in contact with the joint capsule, and may communicate with the cavity of the intercarpal joint. Fig. 3a.

(7) Flexor carpi radialis (flexor metacarpi internus). Extends from halfway down the lower third of the radius to the level of the head of the medial small metacarpal bone. Fig. 3b.

(8) The proximal common sheath of the flexor tendons—the so-called carpal synovial sheath. Extends from approximately the attachment of the supracarpal check ligament of the superficial flexor almost as far as the union of the

§ Müller classifies these as subtendinous, but it would appear more reasonable to include them in the list of subligamentous bursae.

† Bursae not shown in any of the diagrams.

subcarpal check ligament with the deep flexor. It surrounds both flexors, *i.e.* flexor digitalis superficialis and profundus, its mesotendon appears usually between the two. The lower extremity of this sheath is fused with the superficial fascia of the tendon of the deep flexor. Fig. 3b.

(9) The distal common sheath of the flexor tendons—the so-called Sesamoidean sheath. Extends from the distal third of the metacarpus to approximately the middle of the os coronae or 2nd phalanx, where it approaches the bursa podotrochlearis. Below the fetlock joint, this sheath extends around both divisions of the superficial flexor muscle. Fig. 3b. [Non-articular Windgall.]

(10) Obturator internus. Extends from the junction of the two heads of this muscle on the external edge of the ischium, where its tendon begins, to about halfway between this point and its insertion in the trochanteric fossa of the femur. The anterior head of the obturator internus is sometimes referred to as the M. pyriformis. This sheath surrounds the tendon as it passes through the lesser sacro-sciatic foramen. It has been referred to as a subtendinous bursa by Sussdorf (1895) and Eichbaum. Figs. 4b, c and d.

(11) Extensor digitalis pedis lateralis (peroneus longus). Extends from just above the lateral malleolus of the tibia to the proximal end of the large metatarsal bone, 2 to 4 cm. above the union of this tendon with the tendon of the extensor pedis. Fig. 4a.

(12) Extensor digitalis pedis longus (extensor pedis). Extends from the level of the lateral malleolus to just above the union of this tendon with the tendon of the peroneus longus. Fig. 4a.

(13) Around the medial insertion of the tibialis anticus tendon, *i.e.* the cunean tendon. Extends from the lower extremity of the tibia to the insertion of the tendon on the cuneiform parvum (1st and 2nd tarsal) bone. It crosses the tendon of the peroneus tertius. (According to Zietzschmann and Kruger (1929), there is also a sheath around the distal portion of the peroneus tertius, but neither Müller or others have been able to find it.) The majority of authors refer to this as a bursa vaginalis, but Müller considers that it is definitely a sheath. It covers the cunean tendon over the seat of spavin. Fig. 4b.

(14) Flexor digitalis pedis longus (flexor accessorius). Extends from the junction of the middle and distal third of the tibia to the proximal extremity of the large metatarsal bone. Fig. 4b.

(15) Flexor hallucis longus (flexor perforans). Extends from just above the level of the lateral malleolus of the tibia to the junction of this tendon with the flexor accessorius in the upper third of the metatarsal region. According to Eichbaum it may communicate with the tarsal joint. Fig. 4b. [Non-articular Thoroughpin, or Articular Thoroughpin if it communicates with the tarsal joint.]

The common sheath of the flexor tendons at the fetlock joint is similar to that of the fore limb.

III. Review and Original Observations

Müller rightly emphasises the difficulty in identifying these structures in normal animals. It is essential to inject them to show their position, and it must be borne in mind that this is an abnormal presentation, which resembles more their condition in disease. Even those which are constant are not commonly seen in the dissection room on account of their small size, thin walls and close association with other structures. They are better seen in the fresh specimen. Adventitial bursae are more in evidence, as they are really pathological, although even these are not easily demonstrated before thickening of the bursal wall and changes in either the amount or the nature of the synovial fluid have taken place.

There appears to be considerable confusion as to the correct definition of the term "subcutaneous bursa" and of the nomenclature of the bursae which may be classed in this group. The distribution of fascia is very intricate. The superficial fascia consists of two layers. The superficial layer of the superficial fascia is immediately beneath the skin: it is often associated with the panniculus muscle; in some regions it is thick, in others thin, and it may or may not be adherent to the underlying tissues. The deep layer of the superficial fascia is a prolongation of the superficial layer: it passes between muscles and partly covers deeper muscles. The deep fascia is associated with tendons, ligaments, arteries, veins, nerves and even bones. It is possible that in some places even this fascia is a prolongation of the superficial fascia, so that there may be a direct contact between the two. In areas associated with a prominent structure, usually bone, where the superficial layer of the superficial fascia is thin, an additional layer of fascia may be found immediately beneath the skin. This results in a thickening of the superficial layer. Sometimes a bursa appears between this extra layer and the normal superficial layer: such bursae are referred to as "adventitial" or "mucous"; they are marked with an asterisk in the diagrams and are pathological in nature, although they may not exhibit marked pathological changes. A bursa beneath the normal superficial layer of superficial fascia is referred to as "reactive" or "functional." A bursa beneath the deep layer of superficial fascia is referred to by Müller as "subfascial" but might perhaps be termed "deep subcutaneous." A bursa beneath the deep fascia is referred to according to the structure with which the fascia is associated.

Typical bursae, which are usually connected with deeper structures, are present or preformed at birth, as are tendon sheaths. A functional subcutaneous bursa is formed as a result of normal mechanical working between normal tissues after birth. An adventitial subcutaneous bursa is formed as a result of external pressure or abnormal mechanical working associated with the formation of the additional layer of subcutaneous fascia.

It would appear easier, therefore, to refer to all bursae associated with the superficial fascia as subcutaneous and to subdivide them as follows:—

(1) Functional or reactive superficial subcutaneous bursae—those situated beneath the superficial layer of subcutaneous fascia (normal).

(2) Adventitial or mucous subcutaneous bursae—those situated between the additional layer and the superficial layer of subcutaneous fascia (pathological). An adventitial bursa is sometimes referred to as an acquired bursa, but this is really a misnomer as both functional and adventitial types are acquired.

(3) Deep subcutaneous bursa—those situated beneath the deep layer of superficial fascia (normal).

It is possible that the deep layer of the superficial fascia, or any portion of the deep fascia, may become thickened or associated with an additional layer, in which case a deep adventitial bursa may appear at these sites—but these are comparatively rare.

Müller clearly outlines the mode of formation of functional subcutaneous bursae and there is no doubt that adventitial bursae grow in the same way.

It is essential to differentiate between a synovial sheath and a fibrous sheath of a tendon. A synovial sheath according to Sisson (1938) is "a sac folded around a tendon so that two layers can be distinguished: the inner one is adherent to the tendon while the outer one lines the canal in which the tendon lies." This

canal is formed partly by the groove in which the tendon lies and partly by a fibrous band which extends over the tendon, or tendons, to be anchored on either side to the edges of the groove. This band is known as a vaginal or annular ligament, but is sometimes referred to as the fibrous sheath of a tendon, whereas the true fibrous sheath is the outer layer of the tendon itself. Thus an expression such as " the carpal sheath of the flexor tendons " may refer either to this band or to the synovial sheath of the tendons. If the word sheath is to be used for these bands, the two types must be distinguished by stating, for example, " the carpal synovial sheath of the flexor tendons " or the " carpal fibrous sheath of the flexor tendons." It will be seen from this that the synovial sheath of a tendon moves with the tendon and facilitates its passage over a joint, whereas the fibrous sheath or, to be more accurate, the annular ligament, is stationary and serves to hold the tendon in position. Müller has attempted to define the length of these synovial sheaths : as, however, they are subject to some variation it can be assumed for all practical purposes that they surround tendons as the latter pass over joints or, as in rare cases, hard underlying structures.

Bursae which exist in layers in the same part of the body are referred to by most authors as extensions of the same group ; but it is more indicative of their true position if they are classified in separate groups according to the structures with which they are associated.

Although a tendon sheath, with its two layers, is similar to an extended bursa in mode of formation, the greater length of the sheath enables a clear distinction to be made between the two.

The mesotendon is never situated on the pressure side of the sheath of a single tendon, but when two adjacent tendons are surrounded by the same sheath the invaginated portion of the mesotendon is subjected to pressure between the two tendons, and corresponds to their area of contact.

The possibility is pointed out that bursae may join with one another, or with joint cavities, when the anatomy of the region allows of direct contact between the structures in question.

Many of the bursae mentioned as having constant communication with a joint cavity are, however, described by some authors as diverticulae of these joint cavities. In this connection it must be remembered that tendon sheaths and joint cavities fall into two categories :—

(1) Those which are fully protected by overlying structures, *e.g.* the shoulder joint.

(2) Those which are not completely protected by overlying structures, *e.g.* the fetlock joint.

In the first type any increase in the amount of synovial fluid will not easily produce a swelling visible externally unless some pathological process intervenes and causes a weakening of these tissues. In the second type an increase of synovial fluid will cause a swelling to appear at these weak or unprotected spots, *e.g.* windgall.

A regional knowledge of anatomy will assist in determining whether or not a swelling is associated with one of these structures and further if it is an articular or non-articular membrane which is involved.

Although knowledge of the structure of bursae and tendon sheaths is very limited, they bear close resemblance, as Müller states, to joint cavities and contain a small amount of lubricating fluid resembling synovia. Their walls are lined by a connective-tissue membrane which is practically identical with the synovial membrane of joints and may, just as in the case of the latter, be classified as areolar, collagenic or adipose, according to the type of tissue upon which it lies. Its cells show a similar range of distribution to that of the synovial lining cells of joints. It is of very great interest to note that Bonn, in 1763, first described a continuous membrane lining the cavities of joints. The application of von Recklinghausen's silver nitrate method to the synovial surfaces of joints by Hueter, in 1866, led this author to the conclusion that the joint cavities were not lined by endothelial cells, but that the synovial surface was simply a rather cellular connective-tissue surface and that the cellular lining was irregular and incomplete. Hueter's conclusions would appear to have been basically correct, and limited observations which we have made upon the structure of adventitial bursae are in agreement with them. Even at the present day, however, joints and bursae are often spoken of as being lined by " endothelium." It is quite possible to see from the above how bursae may be acquired, as all elements necessary for their formation are present in reactive tissue. There is an ample capillary blood supply and collagen fibres, which form an essential part of the bursal wall, are produced by the activity of fibroblasts. It must also be borne in mind that, in the case of joints at any rate, experimental removal of the synovial membrane may be followed by complete regeneration through metaplasia of subsynovial connective-tissue cells. (Key, 1932.)

Summary

(1) An edited translation is presented of an article by F. Müller on the bursae and tendon-sheaths of the horse.

(2) An illustrated descriptive list of these structures is given.

(3) The main implications of the study are discussed, primarily from the viewpoint of pathological and surgical anatomy, and an attempt is made to clarify the nomenclature of subcutaneous bursae.

Acknowledgements.—This work was commenced when one of us (A. N. W.) was a student at the Royal Veterinary College, and our criticisms are based on work carried out in the College dissection room. We are indebted to Miss A. V. Greener for certain histological examinations, and to Miss J. Vise for the diagrams.

References

Key, J. A. (1932). " The Synovial Membrane of Joints and Bursae " ; in Cowdry's Special Cytology. Vol. II. Paul B. Hoeber, Inc., New York.

Sissons, S. (1938). " The Anatomy of the Domestic Animals," revised by J. D. Grossman. W. B. Saunders & Co., Philadelphia and London.

A pleasing and somewhat unexpected reminder of happier days reaches us in the news that the annual horse show of the Royal Dublin Society will be held on the Society's premises at Ballsbridge, Dublin, from August 6th to 10th inclusive. The programme this year is more attractive than ever and a large sum of money is offered in prizes, besides numerous trophies.

THE VETERINARY RECORD
June 29th, 1940.

BURSAE AND TENDON SHEATHS OF THE HORSE

WE COMMEND to our readers the article which appears elsewhere in this issue on "Bursae and Tendon Sheaths of the Horse" by Messrs. Ottaway and Worden. Within recent years there has been a tendency to relax our efforts in the advancement of surgery and applied anatomy of the horse in favour of more concentrated attention on the other domesticated animals, particularly the dog. For this reason the authors of this article are to be congratulated on coming forward with advanced information on the mode of development and the anatomical and surgical details of bursae and tendon sheaths of the horse. This will prove valuable to the surgeon in his technique and also to the clinician in arriving at a diagnosis. Up to the present the surgical anatomy of bursae and sheaths has not received the attention it deserves and the paucity of English literature on this subject is surprising considering the importance of a detailed knowledge of these structures to those members of our profession who are interested in horse practice. Again the meagre accounts of bursae and sheaths which are found in many anatomical text-books deal with the subject mainly from a purely anatomical aspect and neglect the surgical standpoint.

Some bursae and sheaths are of more surgical importance than others, depending on whether they communicate with joints, their risks of injury by accident and the possibilities of their becoming involved in some local or general infection. When a bursa or sheath is opened accidentally it discharges a fluid which is similar to the synovia which escapes from an open diarthrodial joint. On this account an open sheath may be readily mistaken for an open joint and this is most likely to occur in connection with the carpal joint in the case of so-called "broken knee" where the sheath of the extensor carpi radialis (extensor metacarpi magnus) tendon may readily become opened by such an accident as the animal falling on a rough road.

It may be observed that tendon sheaths rarely communicate with joints although the important sheaths of the body are found in close proximity to the carpal and tarsal joints and also directly behind the joints of the digit. Bursae, on the other hand, communicate frequently with joints, some constantly and others sometimes. It is obvious that such communications are of extreme surgical importance and should be carefully noted in the study of arthrology since the accidental opening of such a bursa results in an open joint. Our knowledge in this respect is considerably advanced by the article under discussion. Many of the bursae described as having constant communication with joint cavities have hitherto been described by earlier authors as diverticula of these joints. For example, that synovial sac behind the upper extremity of the radius beneath the extensor carpi ulnaris (flexor metacarpi externus) muscle is now described as a bursa in constant communication with the joint-cavity of the elbow, whereas its previous designation was a diverticulum of this joint. It may be worthy of note that this bursa or diverticulum is of particular practical importance since it becomes very superficial, in fact, almost subcutaneous, behind the lateral (outer) ligament of the elbow and consequently may be opened by a superficial wound.

Tendon sheaths and bursae are similar not only in the physiological sense but also in structure and mode of development and they are constructed on the same principle as joint capsules. Sheaths are present or preformed at birth as are the typical bursae which are usually connected with deeper structures. On the other hand, certain bursae are acquired; that is to say, they are post-natal in origin, having been developed at some time during the animal's extra-uterine life. Our earlier conception of differences between bursae of ante-natal and post-natal origin was to the effect that the former were typical or true bursae having a synovial membrane, whereas the latter were atypical or false, having no synovial membrane, and were developed during life as a result of mechanical effects, chiefly movements; these latter included those bursae which are now, for the most part, classified as subcutaneous. In the light of modern investigation, however, it would appear that no such differences exist and that all bursae have the same structure irrespective of whether they have been formed before or after birth. It has been shown that all fully-formed bursae, whatever their time of origin, are lined by a connective-tissue membrane which is practically identical with the synovial membrane of joints and that this membrane may be acquired at any time during life, since all the elements necessary for its formation are present in the reactive tissues in the neighbourhood. There is ample capillary blood supply, and collagen fibres which form the essential membrane of the bursal wall are produced by the activity of the fibroblasts. In the case of joints, recent investigation has shown that experimental removal of the synovial membrane may be followed by complete regeneration through metaplasia of subsynovial connective-tissue cells.

Our readers owe to the authors of the article which is the subject of this editorial a deep debt of gratitude for their lucid exposition of the most recent and authoritative information on this all-important subject and they can rest assured that their efforts will be highly appreciated and welcomed by the veterinary profession in general, not only in this country but elsewhere.

CLINICAL COMMUNICATION

A "Twin" Monstrosity

WM. C. AULD, M.R.C.V.S.,
WINCANTON

Subject.—A Shorthorn cow, about six years old, due to calve her fourth calf.

Case.—An urgent call was received that this cow was in trouble calving, although the calf was apparently presented normally. The owner had attempted delivery, and on my arrival, two fore legs and the muzzle of a calf were visible. On examination, however, two hind legs were also found in the pelvic cavity presented in the normal breech manner. No abnormality could be detected within reach, and the case was considered to be twins coming more or less together. Attempts to push the second calf forward to release the first were wholly unsuccessful. Epidural anaesthesia was given, and careful examination of all parts of both calves, within reach, was made. It was then noted that on moving one calf, either backward or forward, the other calf also moved in the same direction. Some connection between the two was, therefore, considered to exist, and, as no progress could be made by pulling the first calf, traction was applied to the hind legs of the second. Delivery was delayed when the hips of both calves reached the pelvis, but, with copious lubrication, was accomplished without injury. The first calf was alive when the operation was commenced, but both were dead on delivery.

The monstrosity comprised two bull calves, fully developed in every detail, joined together by muscular tissue (the right hip of one to the left hip of the other), the connection being about six inches in diameter.

The cow made an uneventful recovery.

SALE OF UNSOUND MEAT

At the June meeting of the Executive Council of the National Federation of Meat Traders, the President (Mr. F. J. Toop), reporting on a deputation to the Ministry of Health, said that attention had been directed to the fact that there appeared to be a serious increase in the sale of meat from cats' meat shops, much of which it was believed was being sold for human consumption, thus avoiding the provisions relating to the control of meat. The Ministry stated that if they could have evidence as to unsound meat being sold for human food, they would take what steps they could to stop it, but obviously they could not act without evidence. As the trade knew, meat intended for human food had to be slaughtered in authorised slaughterhouses, and it seemed to the Ministry that the real problem was to control the slaughtering.

The deputation had suggested that the Ministry should insist that all meat sold other than for the purposes of human food should be marked in such a manner as to indicate that it was not intended for human food, as it was felt that this would tend to stop the practice of selling this class of meat for human consumption.

* * * * *

Swansea Markets Committee has decided that despite the view of the Area Livestock Officer as expressed in a letter to the Town Clerk, that the condition of the slaughterhouses in the borough is deplorable, the present time is, having regard to the state of emergency now existing, not an opportune one to proceed with the establishment by the Corporation of an abattoir.

ABSTRACTS

[GENERAL ANAESTHESIA IN LARGE ANIMALS. FOWLER, S. R. (1940.) *J. Amer. vet. med. Assoc.* **96.** 210. (5 refs.).]

The four methods of producing general anaesthesia are discussed in this article—the two more important in considerable detail.

I. *Inhalation Anaesthesia.*—Chloroform is the outstanding drug used for producing general anaesthesia in large animals, but as bovines, especially adult bulls, are very bad risks and there is a high mortality among swine, most remarks are applicable to equines. The administration of basal narcotics is advised as it facilitates casting and restraint, reduces the amount of anaesthetic needed, and by lessening the initial periods of fear and anaesthetic excitement, minimises the flow of adrenalin and consequent danger of heart failure. In an account of the technique of induction it is interesting to note that American practitioners rarely use a chloroform mask, finding a heavy Turkish towel equally effective.

The various stages of anaesthesia are fully described, with detailed observations on the symptoms, normal and abnormal, which are to be noted. Stress is laid upon the importance of keeping an even plane of anaesthesia throughout the operation, and of ensuring that surgery is not begun during a state of hypnosis, failure on either of these points leading to a great danger of heart failure from one cause or another. Reference is made to the depressant action of chloroform causing a rise in the CO_2 threshold of the respiratory centre, which leads to periods of apnoea during the early stages of induction, or during recovery —these symptoms need cause no alarm so long as the pulse remains strong.

Heart failure may follow cardiac depression, cardiac anoxia, or ventricular fibrillation, often arising from some avoidable error in technique. Examples are the pushing of anaesthesia too rapidly or continuing administration too long, leading to cardiac depression, and initial excitement, or too light anaesthesia, allowing sudden pain to be felt, causing the liberation of adrenalin or onset of ventricular fibrillation. At least three months should elapse before a second administration of chloroform is undertaken, on account of the invariable degeneration of liver, heart muscle and kidneys, following its use.

Given skilful administration and freedom from exposure to respiratory infection chloroform is the most convenient and possibly the safest general anaesthetic for equines.

II..—*Anaesthesia by Intravenous Injection.*—Chloral hydrate in a 12·5 per cent. solution in water is the most popular drug used for this type of anaesthesia. Describing the technique of administration, it is suggested that a tom-cat catheter, passed through the lumen of a 14-gauge hypodermic needle previously inserted into the jugular vein, be used for injecting the solution. The closed rounded end of the catheter with small openings just above, prevents accidental transfixing of the vein and subsequent perivascular injection. Anaesthesia deepens for two to three minutes after completing the injection, then remaining constant for 30 minutes. It is suggested that 4 oz. of chloral be the maximum dose, supplemented by local anaesthesia if necessary. The frequent, unexplained jugular pulse observed under this drug need cause no

apprehension. In collapse, cardiac and respiratory failure occur almost simultaneously. For horses which have been exposed to respiratory infection, and for the single-handed field practitioner, chloral is a very practical general anaesthetic for equines, though its disadvantages are (1) difficulty in regulating depth of anaesthesia; (2) slowness of elimination and difficulty of overcoming cardiac or respiratory weakness; (3) lengthy period of recovery.

In bovines there is a high mortality.

Nembutal is reported as a useful anaesthetic in foals, especially in fractures. There is usually less struggling than with other methods and this together with the small quantity of solution needed and slight post-anaesthetic depression, are its main advantages. There is insufficient evidence to assess its value in adult horses. In young cattle results are promising.

III.—*Drugs introduced into the Digestive Tract* for inducing general anaesthesia give very irregular results and have little to recommend them though chloral hydrate (180 grains per 50 lb. body weight) is as satisfactory a general anaesthetic as is available for pigs, but is still unreliable.

IV.—*By the Intraperitoneal Route* nembutal and chloral hydrate have been tried for swine, the former with poor results, though the latter was more satisfactory.

A. E. K.

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[SOME OBSERVATIONS ON EQUINE OSTEOMALACIA IN CHINA. Heane, C. W., and Simpson, K. D. (1939.) *J. R.A.V.C.* **10.** 153-157.]

The soil of China is deficient in lime and osteomalacia is of considerable economic importance. It occurs usually in horses between the ages of six and thirteen. Symptoms develop gradually; intermittent lameness with no obvious cause is considered to be suspicious. Lameness usually spreads to all four legs and a characteristic straddling of the hind legs is seen. The shoulder and hip joints are chiefly affected and the stride is shortened. Bilateral swelling of the facial bones and enlargement of the mandible may occur. The appetite is lost and the animal becomes unthrifty.

Treatment, to be effective, should commence within a week of the onset of typical symptoms. The intravenous injection of 5 doses of 500 c.c. of a 12 per cent. solution of calcium gluconate at three-day intervals is recommended; 6 oz. of powdered limestone a day is added to the diet. Good hygiene and absolute rest are essential.

For preventive treatment the diet should be adjusted so that the calcium-phosphorus ratio lies between 1 : 1 and 1 : 2. Bran should be fed only in small quantities; lucerne hay is high in calcium and should be fed if possible. The addition of 4 oz. a day of powdered limestone and of 4 oz. of molasses to the diet is also recommended.

A. T. P.

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[THE RELATIONSHIP BETWEEN SALIVARY OUTPUT AND INTESTINAL EFFECTS WITH CARBAMINOYLCHOLINE CHLORIDE (LENTIN). Craige, H. (1939.) *J. Amer vet. med. Assoc.* **95.** 701.]

The efficiency of drugs which stimulate the secretory tissues and the musculature of the alimentary canal is usually judged by such clinical symptoms as salivation, defaecation and abdominal pain. In this article more exact data were obtained by use of a fistula of Stenson's duct and a Thiry-Vella loop in two unanaesthetised dogs since the actual secretion and motility effects were recorded. It is interesting to note that throughout the entire period of observation (several months) covering both the preliminary and critical tests there was never any evidence that the experimental animals suffered physiologically as a result of the operation.

Subcutaneous administration of 0·004 mg./kg. of Lentin increased both parotid and intestinal secretion but a dose of 0·001 mg./kg. was without effect. Increases beyond the minimal effective dose produced proportional increases in quantity excreted and duration of flow in the case of parotid secretion whereas, although this was also true in the case of intestinal secretion in doses up to 0·020 mg./kg., neither rate of output nor quantity secreted were augmented above this dosage.

It is also shown that intestinal motility was definitely increased by a dose of 0·004 mg./kg. but not by 0·001 mg./kg. and that increased dosage beyond this amount did not stimulate motility further.

The author concludes that it is reasonable to suggest that the above results show that in the dog the smallest dose of carbaminoylcholine chloride with a definite sialogogue action is also the smallest dose which augments motility and secretion in the small intestine. With dose increases beyond this minimal within the therapeutic range (0·004 to 0·020 mg./kg.), the salivary effect both as to the period of salivation and the total output varies directly with the dose. On the other hand, the smooth muscle and glands of the intestinal wall do not appear to respond to the same extent to the same influence, since the records reveal a maximal output of intestinal juice and maximal contraction curves with submaximal doses.

J. S.

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[DIETARY PROBLEMS OF RANCH-RAISED MINK. Nelson, J. A. (1939.) *Canad. J. comp. Med.* **3.** 205-210.]

The author states that nutritional diseases are the principal cause of illness and death amongst mink. In comparison with other animals this species is resistant to infection; internal and external parasites are rarely seen when proper hygienic housing is practised. Details of the natural habits of mink and their management in captivity are given. Enteritis is a common ailment and is principally caused by too great a proportion of cereal in the ration. The mink is primarily carnivorous and its intestines are poorly adapted to the digestion of starch. Enteritis may also arise from over-feeding, since mink will commonly hoard excess to eat later, when the food may no longer be wholesome.

Kidney and bladder stones are stated to be extremely common. It has apparently been established that the cause is deficiency of vitamin A, and that the feeding of cod liver oil will prevent the occurrence of the stones.

Other conditions probably attributable to nutritional deficiency are cannibalism, tail biting and sucking, and a form of agalactia in suckling females characterised by atrophy of the mammary glands and death. Finally, certain dietary factors injurious to the pelt are mentioned, *e.g.* excessive cod liver oil or oil of high fatty acid content will cause a reddish appearance of the pelt.

N. J. S.

[**THE DETECTION OF STRYCHNINE IN CARCASES AND CORPSES.** Steyn, D. G. (1938.) *Onderstepoort* J. **10**. 411.]

Experiments were carried out to determine the length of time after death that strychnine could still be detected in carcases and what tests are essential in the examination of materials for the presence of strychnine. Twenty-four dogs had been poisoned with five times the M.L.D. and buried together with five shot dogs acting as controls. The carcases were exhumed after four years and two months, and the bones were extracted by the classical Stas-Otto process and examined for strychnine by three tests : (*a*) Otto's colour reaction, employing potassium dichromate and sulphuric acid, (*b*) taste, (*c*) the biological test, in which 14-day-old white mice were injected intraperitoneally with a salinised product of the extract. Since certain decomposition products (ptomaines) may yield colour reactions similar to that given by strychnine especially in minute quantities, Steyn strongly emphasises the necessity in forensic medicine for application of all three tests for these traces of strychnine, since in the above examination of the dogs, in the few cases in which there was a suggestion of a positive colour reaction the biological test showed the carcases to be devoid of strychnine. The biological test is the one and only safeguard against misinterpretation of the colour reaction. In none of the above dogs could strychnine definitely be said to be present despite the delicacy of the tests applied and Steyn strongly refutes the suggestion that strychnine has been detected in carcases and corpses for periods up to 12 years or longer.

A. E.

REPORT

[**SOUTHERN RHODESIA** : Report of the Chief Veterinary Surgeon, for 1939.]

At a census made during the year there were 2,297,896 cattle in Southern Rhodesia of which about one-third were owned by Europeans and the rest by natives. From these there was a relatively considerable export of animals and animal products ; for example, 3,953 animals were sent for slaughter to South Africa and Portuguese East Africa, 4,527 tons of chilled and frozen beef despatched to the United Kingdom and 553 tons to the Belgian Congo and Northern Rhodesia. In addition a large quantity of meat extract and other meat products were exported overseas and to several neighbouring territories in southern Africa. This export trade is an index of the high quality of cattle now in the colony.

The year was a satisfactory one from the livestock point of view ; pasture was good owing to ample rainfall and the disease position caused no undue anxiety. The colony has now been freed from foot-and-mouth disease and it was hoped that all quarantine restrictions imposed by the recent outbreak would be raised during the current year (1940). East Coast fever persisted in one district and fresh outbreaks occurred in two other districts. Dipping was widely practised against that and other tick-borne diseases. There were 3,304 dipping tanks in use. An outbreak of an unidentified form of Theileriasis occurred in one farm. This disease is under investigation by the Director of Veterinary Research and will no doubt be reported on later. Trypanosomiasis menaced some farms in one district ; bush-clearing and "fly"-trapping were adopted against it. There was a low degree of tuberculosis in certain herds and only one outbreak of anthrax occurred during the year. For the first time Crotalaria poisoning occurred amongst some horses in a farm near Salisbury. Other diseases encountered were heartwater, blackquarter, malignant catarrh and scabies. The colony is now free from rabies.

There were 13 veterinary surgeons employed in field duties in the colony. There is no account of laboratory or research activities, which presumably will be issued separately by the Director of Veterinary Research.

W. K.

IN PARLIAMENT

The following were among the questions and answers recently recorded in the House of Commons:—

Waste Food Stuffs, Salvage

Sir Percy Hurd asked the Minister of Supply whether he is aware that on the lines of the organisation of kitchen waste collection in the boroughs of Tottenham, East Ham and West Ham, about one ton of excellent animal feeding stuffs per week is obtainable from the dwellings of every 6,000 of the urban population; and whether he will take steps to organise this source of supply on a national scale before effect is given to the proposal that two-thirds of the pig and poultry industries of this country should be destroyed?

Mr. H. Morrison: I am aware of the activities of the boroughs referred to in the collection of kitchen waste for stock feeding, and am in close touch with the arrangements proposed by a firm in Stratford, with the concurrence of the Ministry of Agriculture and Fisheries and my Department, whereby such waste, together with collections from other districts within a radius of 10 to 15 miles, would be treated for the production of feeding meals. A conference on the subject with representatives of boroughs in the London area has been held, and I am giving consideration to the possibility of developing similar arrangements in other parts of the country so far as suitable plants are available.

Sir P. Hurd: Will the right hon. Gentleman take into consultation the authorities in the rural areas?

Mr. Morrison: Yes, Sir; so far as they can function in the organisation they will be consulted.*

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Agriculture: Credit Facilities

Mr. De la Bère asked the Minister of Agriculture whether, in connection with the substantial wage increase that farmers are being called upon to pay and the Government assurance that the new prices will take account of the rise in wages and increased costs, he will take immediate steps to couple this with credit facilities to farmers at a rate not exceeding 3 per cent., through the existing bank channels, since some farmers are prevented from engaging extra men needed to deal with the increased acreage crops owing to lack of credit facilities ?

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The Minister of Agriculture (Mr. R. S. Hudson): My predecessor and I have had an assurance from the banks that they will do all in their power to assist farmers in carrying out the food production programme, and I

* It was subsequently (June 24th) announced that the Minister of Supply, Mr. Herbert Morrison, had decided that all local authorities with populations of more than 10,000 would be required to arrange efficient systems for the collection of salvage. All householders in the areas of these local authorities are to be required to co-operate in a new anti-waste campaign. This decision follows a recommendation by the committee of M.P.s set up at the end of May under the chairmanship of Miss Megan Lloyd George.

have no doubt that they will regard this assurance as covering the matter to which my hon. Friend refers. I also propose to instruct county war agricultural executive committees to give sympathetic consideration to applications for goods and services, under the Agricultural Requisites Assistance Scheme, from farmers whose cash resources are likely to be required for the payment of wages. Coupled with the satisfactory prices I hope to be in a position to announce shortly, these measures should be sufficient to allay any apprehensions the farming community may still entertain.

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FERTILISERS

Sir A. BAILLIE asked the Minister of Agriculture what action he proposes to take with regard to the recommendation contained in paragraph 24 of the Sixth Report of the Select Committee on National Expenditure with regard to the need for encouraging farmers to use fertilisers produced from scientifically-treated waste material ?

Mr. HUDSON : I am anxious that suitable waste materials from household refuse should be utilised for fertilising purposes wherever practicable. In conjunction with the Agricultural Research Council, I am actively investigating certain processes at present in operation.

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POULTRY STOCKS

Mr. BOYCE asked the Minister of Agriculture whether the Government's foodstuff policy in respect of poultry envisages a reduction of poultry flocks to one-third of the pre-war figure or to one-third of the existing figure?

Mr. HUDSON: I have advised poultry farmers who are dependent on purchased feeding-stuffs that it will probably be necessary for them to reduce their stocks to one-third of their present numbers by the middle of this autumn. Poultry keepers generally are also being urged to make increased use of waste material for feeding purposes. If this advice is followed I hope the poultry population of the country as a whole can be maintained at a level somewhat in excess of one-third of the pre-war total.

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PIG MARKING

Mr. WILSON asked the Parliamentary Secretary to the Ministry of Food whether he will give details of the serious practical and administrative difficulties in the adoption of some other method for marking of pigs than that of ear marking ?

Mr. BOOTHBY : The object of the ear-marking of pigs is to preserve their identity through the various processes to which the carcases are subjected. No other method has been found which is not open to greater objections than that at present in force.

Sir P. COLFOX : Is the hon. Gentleman aware that there can be no objection to this practice except that the pig squeals much louder than any other animal and that he will squeal whether he is hurt or not ?

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HORSE RACING AND HUNTING

Captain VYVYAN ADAMS asked the Home Secretary whether he will take steps to avoid the squandering of war resources by prohibiting, during the present emergency, horse racing and hunting ?

Sir J. ANDERSON : The Stewards of the Jockey Club have already decided, after consultation with me, to arrange that all horse racing meetings shall be cancelled until further notice. As regards hunting, no practical question will arise until September.

Captain ADAMS : May I ask the right hon. Gentleman whether he will bear in mind that when the hunting season begins hostilities may be still proceeding ?

Sir J. ANDERSON : We will bear that in mind.

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GREYHOUND RACE MEETINGS

Mr. WILSON asked the Home Secretary whether and to what extent, the 30 race meetings per week at the 15 dog-racing tracks in the London area are being reduced owing to his action ; and the number of meetings and races which will now take place weekly before mid-day, between mid-day and 5 p.m., and after 5 p.m., respectively ?

Sir J. ANDERSON : The present arrangement in regard to greyhound racing is that, in order not to interfere with working hours, meetings are only held in the evenings and in the afternoons on Saturdays and days which are local half-holidays. I am now, however, arranging that there shall also be a substantial reduction in the number of meetings.

Mr. GLENVIL HALL : Has the right hon. Gentleman noticed that some daily papers feel so strongly on this matter that they are now ceasing to publish greyhound racing results ?

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OSTEOPATHY

Mr. GLENVIL HALL asked the Minister of Pensions whether he will reconsider his decision not to utilise the services of qualified and registered osteopaths in Ministry of Pensions centres and hospitals unless they are also qualified medical practitioners ?

THE MINISTER OF PENSIONS (Sir Walter Womersley) : I regret that I have nothing to add to the answer I gave the hon. Member on March 4th last.

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

July 1st.—N.V.M.A. Committees, Edinburgh.
July 2nd.—N.V.M.A. **Council** and Committees, Edinburgh.
July 3rd.—Provisional date for commencement of R.C.V.S. Oral and Practical Examinations.
July 5th.—Meeting of the North of England Division, N.V.M.A,, at Newcastle-on-Tyne, 2.30 p.m.
July 5th.—Meeting of the North Wales Division, N.V.M.A., at Mold, 2.15 p.m.
July 8th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 4 p.m.

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National Veterinary Medical Association and the National Farmers' Union

MEETING AT BEDFORD SQUARE

The need for mutual discussion between the National Farmers' Union and the National Veterinary Medical Association having been emphasised during the deliberations of the Executive of the Survey Committee of the Association, the Chairman, Mr. H. W. Steele-Bodger, and the Secretary to the Committee, Professor T. Dalling, met representatives of the Union for a preliminary discussion on Wednesday, May 29th. Mr. H. German, the Chairman of the National Farmers' Union Animal Diseases Committee, agreed to a provisional meeting of a small joint committee, and on Wednesday, June 5th, the first meeting of this Committee took place at the Headquarters of the Union, at 45, Bedford Square.

Mr. H. German was in the Chair, and the Union was further represented by Mr. Thomas Peacock (President), Mr. G. Gibbard (Chairman of the Livestock Committee), Mr. S. O. Ratcliff and Mr. F. T. Graff (Secretary of the

Diseases of Animals and Livestock Committees). The National Veterinary Medical Association was represented by the President (Mr. H. W. Steele-Bodger), Mr. G. P. Male, Professor Wm. C. Miller and Dr. W. R. Wooldridge (Hon. Secretary). The Chief Veterinary Officer of the Ministry of Agriculture (Mr. D. A. E. Cabot) was also present. Professor Dalling was unavoidably prevented from attending.

As the result of a comprehensive general discussion, it was agreed to consider how the services of the veterinary profession could be utilised by the farming community with much greater advantage to the farmers themselves and the country as a whole, particularly by the greater application of preventive medicine in the widest sense of the term.

The National Farmers' Union assured the Association that they appreciated and reciprocated the profession's desire to co-operate in the solution of disease problems, and requested the Association to prepare a memorandum of their views as to how, in future, disease could be fought with first-class results.

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National A.R.P. for Animals Committee

Emergency Co-operation

In view of the intensification of hostile air action against this country, all Veterinary Officers assisting the Committee must be prepared in case of need to answer an "S.O.S." issued by any other Veterinary Officer within reach. Veterinary Officers of the Ministry of Agriculture are also expected to assist in all cases where they have not received more urgent instructions direct from the Ministry.

Full co-operation is essential if the Service is to deal adequately with the casualty results of intensified attack.

It is also advisable that representatives of the animal welfare societies, where such are available, should be informed of all the First Aid Posts established and other arrangements that have been made in their area.

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Veterinary Officers are earnestly requested to return packing cases to the P.D.S.A. Sanatorium as soon as possible, as these are urgently required. They are also reminded that full information should be sent to Headquarters as to what transport (cars, ambulances, lorries, etc.) they have available. This is essential in order that adequate and smooth-working arrangements may be made for the despatch of transport when and where required.

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Emergency Petrol Supplies—London Area

Arrangements have now been made in the London Petroleum Area for the issue from Headquarters, 36, Gordon Square, W.C.1, of petrol vouchers for use at times of emergency, to Veterinary Officers of the National A.R.P. for Animals' Committee and those assisting them with cars. A supply of these coupons will be sent to Veterinary Officers on request, provided they give details of the cars enrolled in their organisation. Envelopes should be marked, in the left-hand corner, "Emergency Petrol."

It is advisable for Area Veterinary Controllers or County Veterinary Officers in other Petroleum Areas to make similar or alternative adequate arrangements for the supply of petrol for N.A.R.P.A.C. vehicles.

THE TREATMENT OF WAR WOUNDS

The Medical Research Council has appointed the following committee, including representatives of the Fighting Services and of the Emergency Medical Service under the Ministry of Health, to advise on the application of the results of research to practice in the treatment of war wounds, and the need for new investigations: Sir Cuthbert S. Wallace (Chairman), Mr. E. Rock Carling, Mr. C. H. S. Frankau, Professor F. R. Fraser, Professor G. E. Gask, Surgeon Rear-Admiral G. Gordon-Taylor, Colonel Sir Charles Gordon-Watson, Sir John C. J. Ledingham, Major-General H. Marrian Perry, Professor R. S. Pilcher, Professor J. Paterson Ross, and Professor W. W. C. Topley (Secretary), with Dr. F. H. K. Green as Assistant Secretary.

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PERSONAL

Marriage.—Edwards-Palmer. On June 1st, 1940, quietly at Loughborough—Frank V. Edwards, M.R.C.V.S., son of Mr. and Mrs. G. Edwards, Dartford, to Vera Margaret, daughter of Mr. and Mrs. A. Palmer, Abbey Wood, S.E.2.

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Mr. Duncan Cumming, M.R.C.V.S., Culter, who has retired after 42 years in practice, was honoured recently by the Peterculter Junior Farmers, in recognition of his services to their club, of which he is a founder-member.

Acknowledging the presentation gift, Mr. Cumming reviewed the activities of the club and compared farming conditions over 40 years ago with those of to-day. He referred to the improvements brought about by enlightened management in the breeding and feeding of all classes of farm stock.

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PARKS AND RACECOURSES FOR CROPS

On the day following the announcement of the decision of the Stewards of the Jockey Club to suspend racing fixtures, the Ministry of Agriculture stated: "Additional powers have been conferred on the Minister of Agriculture that will enable him to give directions for the cultivation of private parks, racecourses and any other land used mainly for sport or recreation. There is no intention at the moment of ploughing up every park and golf course in the country, but where it would be in the public interest that such land should contribute more to food production the Minister will use his new powers."

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R.C.V.S. OBITUARY

Sugden, John William, Oakleigh, Southminster, Essex. Graduated Edinburgh, May 25th, 1910. Died June 20th, 1940; aged 63 years.

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LONDON UNIVERSITY EXAMINERS

The following appointments have been made in connection with the Second (Part II) and Final Examinations in Veterinary Science of the University of London:—

Veterinary Anatomy.—E. C. Amoroso, *J. McCunn (Royal Veterinary College); and the External Staff Examiner.

Veterinary Physiology.—*J. Y. Bogue (Royal Veterinary College); and the External Staff Examiner.

Veterinary Hygiene.—W. C. Miller, *G. H. Wooldridge (Royal Veterinary College); and the External Staff Examiner.

Veterinary Pathology.—*T. J. Bosworth (Lecturer), R. Lovell (Royal Veterinary College); and the External Staff Examiner.

*Board Chairman.

THE POULTRY DECISION

"Inured as he now is to disappointment, the average poultry-breeder would regard the recent announcement by the Minister of Agriculture as a major catastrophe," observes the *Scottish Farmer*. "Briefly stated, the position is that in view of the need for conserving stocks of feeding stuffs it will be necessary for poultry farmers to reduce their flocks at once, and to cut them down to one-third by the middle of autumn.

"We assume that the Government decision has been reached with regret and in view only of the harsh necessities of the military situation. For a time there was a glimmer of hope that the fate of Denmark and the consequent increased demand for home-produced eggs would lead to an attempt to put Britain's poultry industry once and for all on a sound basis. The views of well-known nutrition experts as to the high place of poultry products in the national dietary lent support to this expectation. So did the Agriculture Acts of 1937 which envisaged an expenditure of £25,000 in the succeeding four years in the nation-wide campaign against disease in the industry.

"Many poultry farmers have tackled the position courageously and have succeeded in becoming State-recognised accredited breeders. This has cost heavy expenditure and much labour, for stocks required to be heavily culled and proper conditions of housing, etc., provided. There was no hint of compensation in the Minister's statement, but there seems a case for the special treatement of such unfortunates. The blow will fall most heavily upon the smallholder type of poultry-keeper who has invested his all in poultry stock. The specialist breeder who relies wholly upon imported feeding stuffs will also be hard hit. Only the farmer-poultry-keeper, who grows much of his feeding material, will escape the worst effects of the blizzard, but he, too, will be the loser financially.

"It is indeed a bad time for poultry; and it is hoped that, when happier days return, the State will make prompt and generous provision to give the industry a fair start. Meantime, every inducement should be given to those poultry-keepers who decide to carry on, to maintain their residue stocks in this extremely critical period."

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"COLOSSAL" ANIMAL FOOD WASTE

Speaking at a conferenee of local public authorities held at West Ham, E., Mr. John Beharrell said that not less than 500,000 tons of feeding stuffs for pigs and poultry was thrown into the dustbins of Britain every year. Wasted food throughout the country had been found to average over 50 tons a year for each 4,000 people and even that did not include market waste. It represented each week: Manchester 652 tons, Newcastle 366 tons, Sheffield 254 tons, Glasgow 282 tons, and Aberdeen 45 tons. This waste was capable of being made into a nutritious sterilised meal for the production of bacon, pork and eggs. At present, 95 per cent. of it was disposed of by dumping or by burning at a cost estimated at not less than 6s. per ton. Yet the material, even in crude form, was valued at 25s. per ton.

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LEGAL NOTES

"Added Sugar" in Alleged Milk Adulteration Case.—When a milk producer was charged at Uttoxeter with two offences of selling adulterated milk, a member of the county analyst's department said that it was the first time in the history of the department that they had found sugar added to milk. It was stated that one sample contained 19·3 per cent. of added water and 2·7 per cent. of added sugar, and the other 21·3 per cent. of added water and 2·7 per cent. of added sugar.

Defendant suggested to the inspector that the sugar was due to the beet he had been feeding. This the inspector described as a sheer physiological impossibility. There was no object in adding 4½ lb. of sugar as it came from the grocer, and, though it was not for the prosecution to prove that machine-skimmed condensed milk was added, it was the only satisfactory conclusion.

For the defence the responsibility of sugar beet was persisted in, but with costs the defendant had to pay £14 4s 0d.—*Farmer and Stockbreeder.*

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GRANTS FOR PREMIUM BULLS

"The sum saved by the cancellation by the Ministry of Agriculture of grants under the Premium Bull Scheme is £23,000 a year" (writes a special correspondent to the *Farmers' Weekly*). "In 1937-38 (the last recorded year) there were 1,547 subsidised bulls. As each bull serves about 70 cows in the year, the premium bull scheme produces over 100,000 good quality calves a year at a cost of only a few shillings each. Pedigree cattle breeders are urging the restoration of the grants on two grounds: (1) that the total expenditure was small compared with the improvement resulting and (2) that the maintenance of quality and ability to thrive is of the utmost importance in the food production campaign."

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NATIONAL MILK SCHEME

On the night of Wednesday of last week the Ministry of Food issued the following announcement with regard to the national milk scheme:—

From July 1st, or as soon as possible afterwards, milk will be provided free or at a reduced price to those who need it most. The Ministry of Food's national milk scheme is being introduced as an urgent measure of war-time food policy. Its object is to ensure that the rise in the price of milk made necessary by the increased cost of production and distribution does not affect those classes of the community whose need for milk is greatest.

Under the scheme every expectant or nursing mother and every child under five years of age who has been weaned and is not attending school can obtain one pint of milk daily at 2d. a pint (the present price in most areas is 3½d. and after July 1st will be 4d.). This arrangement applies irrespective of income.

Milk will be supplied in the above quantities free (*a*) if the joint weekly income of the parents or guardians is less than 40s. (plus 6s. for each non-earning dependent member of the household); or (*b*) if the income of the only parent or guardian is less than 27s. 6d. (plus 6s. for each non-earning dependent member of the household); or (*c*) if the head of the household is in receipt of public assistance, unemployment assistance, or supplementary old age pension.

The scheme will be worked by local milk officers attached to the local food office. Parents or guardians wishing to obtain milk at the reduced price, or free, will have to fill up an application form obtainable from the milk officer. Particulars of the number and ages of children will be required, and the correctness of the application will have to be vouched for by a responsible person (*e.g.*, minister of religion, doctor, justice of the peace, solicitor, etc.) having sufficient knowledge of the applicant and the circumstances of the case. The condition of an expectant mother will have to be certified by a doctor, midwife, or health visitor.

Where it is desired to obtain milk free, particulars of the household income will also have to be supplied. When an application has been approved the milk officer will give the applicant a permit which entitles him or her to a supply of milk at the reduced rate or free through a retailer chosen by the applicant. This permit will in the first instance last for not more than three months, and must be taken by the applicant to the retailer. In cases where an application on behalf of a child under one year of age is accompanied by a certificate from a medical practitioner that the child should have dried milk instead of liquid milk the milk officer will authorise an alternative supply of 1 lb. of dried milk a week at the same cost as one pint of liquid milk a day. The scheme

will not apply to persons in public assistance or other institutions, whether municipal or voluntary. In its present form it will not apply to the remoter parts of Scotland. Separate arrangements for these areas will be announced later. The extension of the scheme to Northern Ireland is also under consideration. The scheme will in no way affect the milk-in-schools scheme which it is hoped will now be more widely adopted and taken advantage of by a higher proportion of parents for the benefit of their children. The scheme will not affect the power of a local authority to supply an additional quantity of milk under its own arrangements to any person on the advice of the medical officer of health.

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FEEDING STUFFS AND FERTILISERS: RESIDUAL VALUES

The Department of Agriculture for Scotland have issued revised tables on the subject of the residual value of feeding stuffs and fertilisers. These are as prepared by the Standing Scottish Committee which was appointed by the Department to review the tables each year. The present committee consists of Professor James Hendrick, Mr. John Speir and Mr. W. M. Robertson, and it is their recommendations for the period from April, 1940, that have now been adopted. The last edition of the booklet on residual values was published in 1937. Copies of the 1940 tables can be purchased from H.M. Stationery Office, price 3d. each.

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Dieticians, scientists, experts have written and talked on the possibility of Britain growing all the food for its people. We may yet be driven to the bitter necessity of proving it. Yet all who have gone into this subject have argued on the old standard of living, the elaborate foods of peace-time. If we are forced by siege to put this to the test, as we have not done since the Napoleonic wars, our self-sufficiency will be found in terms of milk and oatmeal, potatoes and cabbages. Every ship that sees our ports will be wanted for other purposes.—*Farmers' Weekly*.

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THE ACUTE SINUS

In view of the topical interest recently aroused in the matter of equine sinus disease, the following editorial article in our contemporary, the *Lancet*, upon the acute sinus in the human subject, will be of interest to many of our readers.

"The papers read before the clinical congress of the American College of Surgeons at Philadelphia* illustrate how the attitude towards acute sinus infection has changed as knowledge of its natural history has become more exact. The advances in physiology for which Proetz of St. Louis has been largely responsible have led to a growing respect for the natural defences and more particularly for the cilia. The nasal cavities and accessory sinuses are lined by a ciliated and mucus-secreting membrane, and the cilia are so arranged that they carry the mucus from the sinuses out through the openings into the nose and thence into the nasopharynx where it is swallowed. Thus dust and bacteria in the inhaled air are caught by the mucus like midges on a flypaper and carried away to face the destructive action of the intestinal ferments. This is the first line of defence for the air-passages. Excessive secretion or pus in the nose or sinuses is removed in the same way. A good current of air through the nose is an important accessory mechanism. It is essential to preserve these activities as far as possible and not to hinder them by over-energetic therapeutic measures.

"General conditions predisposing towards sinus disease are lowered resistance, improper hygiene, faulty diet and allergy. Each to some extent interferes with ventilation and drainage by producing congestion and swelling of the nasal mucous membrane or drying of the nasal secretions. Local factors are anatomical abnormalities such as a badly deviated septum or adenoid overgrowth, sepsis in neighbouring organs, especially the tonsils, and narrowed anterior nares hindering the flow of air. The organisms responsible for the condition are those commonly present in the nose or throat either as primary invaders or secondary to a virus infection such as influenza or measles. The commonest is the streptococcus. The inflammatory process causes vascular engorgement of the mucous membrane and excessive secretion. The swelling reduces the circulation of air both in the nasal cavities and sinuses, and the cilia, partly disorganised by the catarrh of the cells from which they arise, are now faced with the task of removing an extra amount of secretion in unfavourable conditions. The catarrhal phase becomes a purulent one, but pus does not of itself inhibit ciliary action. The frontal sinus, anterior ethmoidal cells and maxillary sinus drain into the middle meatus by small and easily obstructed openings separated only by a centimetre or so. Swelling of the mucous membrane of this area of the middle meatus may result from the drainage of pus from any one of the sinuses. Partial or complete occlusion may also be caused by inspissated pus. By whatever method the obstruction is produced headache may follow, for if there is active infection the secretion formed cannot be removed by the cilia and intrasinous pressure rises. If, on the other hand, there is only slight infection, the air in the sinus is absorbed and a negative pressure is set up giving rise to the "vacuum headache" described by Sluder. A frontal headache is thus not always due to an infection of that sinus. However it arises the headache typically has some peculiar characters. It comes on in the morning when the patient awakes, reaches a maximum about noon, and gradually disappears in the early afternoon. It is an unpleasant nauseating pain and very incapacitating. In addition, neuralgic pains may be felt in any part of the distribution of the trigeminal nerve and even referred to some of the cervical nerves.

"The patient with acute sinusitis will get well most certainly and rapidly if he stays in bed. Unfortunately he is rarely willing to do this unless forced by headache or severe constitutional symptoms. As well as the usual general methods employed in dealing with acute sepsis sulphanilamide is valuable in streptococcal infections. It must be given in full doses from the outset for a maximum effect, and its possible toxic action should always be remembered. Vitamins A, B, C and D are useful and many preparations are now on the market containing all four. Alkalis are supposed to be helpful. Allergy should be suspected when a large number of eosinophils are present in the nasal secretions. If the allergen can be discovered specific treatment may reduce the turgescence of the nasal mucosa and by improving aeration may assist the natural processes of cure. Finally, the patient should avoid badly ventilated rooms. In prescribing local measures the utmost care must be taken to avoid damage to the cilia. Ventilation and drainage of the sinuses must be secured and the inflammation treated by heat. Diathermy or short-wave irradiation are convenient ways of applying heat—claims of a more specific action have not yet been proved. Ephedrine and cocaine in weak solutions have been shown to do no harm to the cilia. A spray of ephedrine sulphate 0·5 per cent. in isotonic saline has a prolonged astringent action and can be used every four hours together with a steam inhalation containing not more than a grain of menthol in a pint of water. Patients often find the local application of chloretone in liquid paraffin soothing, but the cilia do not work well in this medium. If pus is still present in the maxillary sinus after three or four days of conservative treatment, especially if there is much pain, antral puncture and lavage should be performed under a local anaesthetic. With care this should not be painful, and most patients are so relieved by the operation that they do not object to its repetition. It is sometimes necessary to catheterise and wash out the frontal or sphenoidal sinuses but these are manipulations for the specialist. The fundamental principle is to assure free ventilation and drainage but to treat the mucous membranes gently."

*Hill, F. T., *Surg. Gynec. Obstet.*, Feb. 15th, 1940, p. 531; Orton, H. B. *Ibid*, p. 534.

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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PROVISION OF FREE QUALIFIED TREATMENT BY ANIMAL WELFARE SOCIETIES

To the Editor of the Veterinary Record

Sir,—May I be permitted to refer to the report of Sir Robert Gower's speech at the Annual Meeting of the Royal Society for the Prevention of Cruelty to Animals which is reported in your issue of June 22nd.

Sir Robert Gower referred to the treatment of sick and injured animals by qualified diagnosis (I presume he means by animal welfare societies) as having started in 1909. Whilst I have no doubt that that is a correct statement, provided the words "by the R.S.P.C.A." were added, I must, in fairness to my Society, point out that the implication appears that this was the first effort of this kind, which is not correct, as a hospital under qualified control was started by Our Dumb Friends' League in 1904, and actually opened in 1905 upon its present site. I believe I am right in saying that this was the first free hospital for animals organised by a charity not only in England but in the world.*

I must add that, in the course of the history of the profession, veterinary surgeons have always treated animals of those who were unable to pay their fees without a charge, and with the foundation of the Veterinary College in 1791 there was a definite place where the poor could take their animals for free treatment.

Yours faithfully,
E. Keith Robinson,
Secretary, Our Dumb Friends' League.

Grosvenor Gardens House,
Victoria, London, S.W.1.
June 22nd, 1940.

* It should be noted, however, that the Brown Institution, under the London University, provided free qualified treatment for the animals of the poor from its foundation in 1871 to recent times, when a small charge was instituted.—Editor.

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"DUTCH VET."

To the Editor of the Veterinary Record

Sir,—May I endorse most of A. C. Fraser's letter in last week's Record, although in my view "Vet." does not deserve the adjectives "stunted and displeasing." To my plebeian mind the short and simple "Vet." is quite pleasing and it has at any rate become a term of approbation, indicative of a job well done or, as A. C. F. says, "to examine with scrupulous care." A. C. F., being himself a Ph.D., will appreciate that here at any rate we (the vets.) are one up on the doctors, for the dictionary gives: "To doctor=to adulterate; to make alterations on; to falsify."

One remembers in the old days being greeted, not with shouts of "Here's the vet." but "'ere be varrier"—*Infra dig*! Decidedly, but did I or the profession as a whole suffer any "loss of dignity"=degradation, thereby? Not at all.

Yours faithfully,
J. R. Baxter.

Lechlade,
Glos.
June 23rd, 1940.

DISEASES OF ANIMALS ACTS, 1894 to 1937, and AGRICULTURE ACT of 1937 (PART IV)

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 16th to 31st May, 1940	26	27	—	—	2	2	6	209	112
Corresponding period in ...									
1939	34	41	—	—	2	5	1	147	113
1938	36	43	1	125	2	4	4	40	28
1937	59	73	—	—	5	6	2	51	37
Total 1st January to 31st May 1940	260	281	18	2,548	14	28	115	1,667	922
Corresponding period in									
1939	401	432	29	4,357	28	60	147	765	488
1938	429	468	152	19,883	40	65	98	220	145
1937	358	409	3	262	77	114	116	500	309

Note.—The figures for the current year are approximate only. § Excluding outbreaks in Army Horses.

Tuberculosis (Attested Herds) Schemes

The number of Attested Herds, *i.e.* herds officially certified as free from tuberculosis, as at 31st May, 1940, was as follows:— England 3,741 ... Wales 9,277 ... Scotland 2,982 ... Total (Great Britain) 16,000